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North Coast Land and Resource Management Plan

Current Conditions Report

A Component of British
Columbia's Land Use Strategy

North Coast
LRMP

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Current Conditions Report:
North Coast Land and Resource Management Plan

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Prepared for:
Prince Rupert Interagency
Management Committee
Smithers, B.C

March 2001

This report was prepared by independent consultants, Greg Tamblyn and Hannah Horn, as background information on the natural, cultural, and socio-economic features, land uses and resources management in the North Coast LRMP area. The information in this report was collected from a wide range of sources and was reviewed by government staff for accuracy and completeness. The final product is presented as the professional judgement of the authors and does not necessarily reflect the view of the Province.

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LIST OF ACRONYMS

AAC	Allowable Annual Cut
ADSL	Asymmetric Digital Subscriber Line
ALR	Agricultural Land Reserve
AOA	Archaeological Overview Assessment
AUM	Animal Unit Month
BEC	Biogeoclimatic Ecosystem Classification
BEI	Broad Ecosystem Inventory
BEOs	Biodiversity emphasis options
BEU	Broad Ecosystem Unit
CCLCRMP	Central Coast Land and Coastal Resource Management Plan
CLI	Canada Land Inventory
CMTs	Culturally modified trees
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWD	Coarse woody debris
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
FPC	Forest Practices Code
IWMS	Identified Wildlife Management Strategies
LRMP	Land and Resource Management Plan
MELP	Ministry of Environment, Lands and Parks
MOF	Ministry of Forests
MoTH	Ministry of Transportation and Highways
MSBTC	Ministry of Small Business, Tourism, and Culture
MU	Management Unit (for wildlife)
NWA	Nass Wildlife Area
NWC	Nass Wildlife Committee
NDT	Natural Disturbance Type
PAS	Protected Areas Strategy
PNW-CFDC	Pacific Northwest Community Futures Development Corporation
PREDC	Prince Rupert Economic Development Commission

RIC	Resources Inventory Committee
RMZ	Resource Management Zone
RPAT	Regional Protected Areas Team
TFL	Tree Farm Licence
TOS	Tourism Opportunity Study
TSA	Timber Supply Area
TSR	Timber Supply Review
TTC	Tsimshian Tribal Council
TUS	Traditional use study
VIA	Visual impact assessment
VQO	Visual quality objective
WHA	Wildlife Habitat Area

Biogeoclimatic subzones:

CWHwm	Coastal Western Hemlock wet maritime
CWHvh	Coastal Western Hemlock very wet hypermaritime
CWHvm	Coastal Western Hemlock very wet maritime
CWHws	Coastal Western Hemlock wet submaritime
MHmm	Mountain Hemlock moist maritime
MHwh1	Mountain Hemlock wet hypermaritime
AT	Alpine Tundra

Ecosections:

APM	Alaska Panhandle Mountains
BOR	Boundary Ranges
DIE	Dixon Entrance
HEL	Hecate Lowland
HES	Hecate Strait
KIR	Kitimat Ranges
QCS	Queen Charlotte Sound

1.0 INTRODUCTION AND PURPOSE

This background report provides an overview and summary of information describing the natural, cultural, and socio-economic features of the North Coast LRMP area. The information in this report is intended to provide participants in the North Coast LRMP with a current picture of the conditions and characteristics of land use and resource management in the plan area. The key components of the document are:

- ☐ A description of the plan area, including social, economic, and environmental attributes;
- ☐ An overview of resource uses and associated strategic planning issues;
- ☐ A history of planning in the area; and
- ☐ A summary of provincial government agencies, their mandates and current legislation related to strategic land use planning.

The information shown here is based on data and information from published journals, books, and government documents, current inventory information, and from discussions with government staff. This information base will be expanded through consultation with local stakeholders and interest groups during the LRMP process.

Geographic area included in the report

This report provides data and information on the North Coast LRMP area (Map 1). The LRMP approximates the boundaries of the North Coast Forest District, with the following exceptions:

1. 135,691 ha of Princess Royal Island and the southern mainland, including parts of Tree Farm Licence (TFL) 25, are being addressed in the Central Coast Land and Coastal Resource Management Plan (CCLCRMP).
2. The Nisga'a Lands, comprising 58,068 ha in the north of the plan area, have been excluded from the LRMP.
3. Some of the Skeena Islands are being addressed in the Kalum LRMP.

The total size of the plan area is 1,756,223 ha. This includes 1,690,887 ha of the North Coast Timber Supply Area (TSA) and 65,336 ha of TFL 25.

Where possible, we have presented data based on the LRMP area, although much of the existing data is available based on the boundaries of the North Coast Timber Supply Area (TSA). Due to limitations of time we have been unable to do all of the analyses required to adjust the TSA data to the LRMP area. We have noted in the text where the data applies to the TSA rather than the LRMP area.

2.0 THE NORTH COAST PLAN AREA

2.1 The Biophysical Setting

The North Coast LRMP area is bounded by the Pacific Ocean to the west and the Coast Mountains in the east. The Skeena River bisects the mainland, while ocean straits, channels and inlets cut through the rugged landscape and separate the mainland from numerous islands. Small to mid-sized lakes dot the coastal lowlands and numerous streams and small rivers originate in the mountains in the east.

Reflective of the area's geography, the climate is coastal. The ocean moderates temperatures and prevailing westerly winds deliver large amounts of rain. Low pressure systems in the north Pacific drive the weather systems for most of the year. Winters are mild and summers are cool relative to areas further inland. Temperatures range from an average of 15.5°C in July to –2.2°C in January. Precipitation is common throughout the year, although late spring tends to be the driest season. Prince Rupert averages 1408 hours of sunshine and greater than 250 centimetres (98 inches) of precipitation per year. Snow is not uncommon at sea-level in the winter months, although it does not tend to accumulate. Deep accumulations of heavy, wet snow are common at high elevations. This combination of cool and wet conditions supports a lush and diverse vegetation typical of temperate rainforests along the coast of British Columbia (See Section 3.1: Vegetation Ecology).

2.1.1 Ecosystem classification

Two of the most common methods for describing the ecosystems of British Columbia are the Biogeoclimatic Ecosystem Classification (BEC) system and the Ecoregion Classification system. The BEC system (described in Pojar et al, 1987) delineates areas into biogeoclimatic zones according to climate, elevation, soils and potential climax vegetation[1]. The North Coast LRMP area has three biogeoclimatic zones: Coastal Western Hemlock (CWH: 66.7%), Mountain Hemlock (MH: 25.8%) at higher elevations, and non-forested Alpine Tundra (AT: 7.5%). A more detailed description of the BEC zones in the plan area is provided in Section 3.1: Vegetation Ecology.

A broader method of describing ecosystems is the Ecoregion Classification system (described in Demarchi, 1996). This system is designed to "bring into focus the extent of critical habitats and their relationship with adjacent areas" (Demarchi et al, 1990). The Ecoregion Classification system is hierarchical. The five levels of zoning, from largest to smallest, are as follows: ecodomains, ecodivisions, ecoprovinces, ecoregions and ecosections. Ecodomains and ecodivisions are very broad (e.g. four ecodomains are found in B.C.) and place the province in a global context based on broad geographical relationships. The remaining three levels place the province in context with the rest of the continent or relate areas within the

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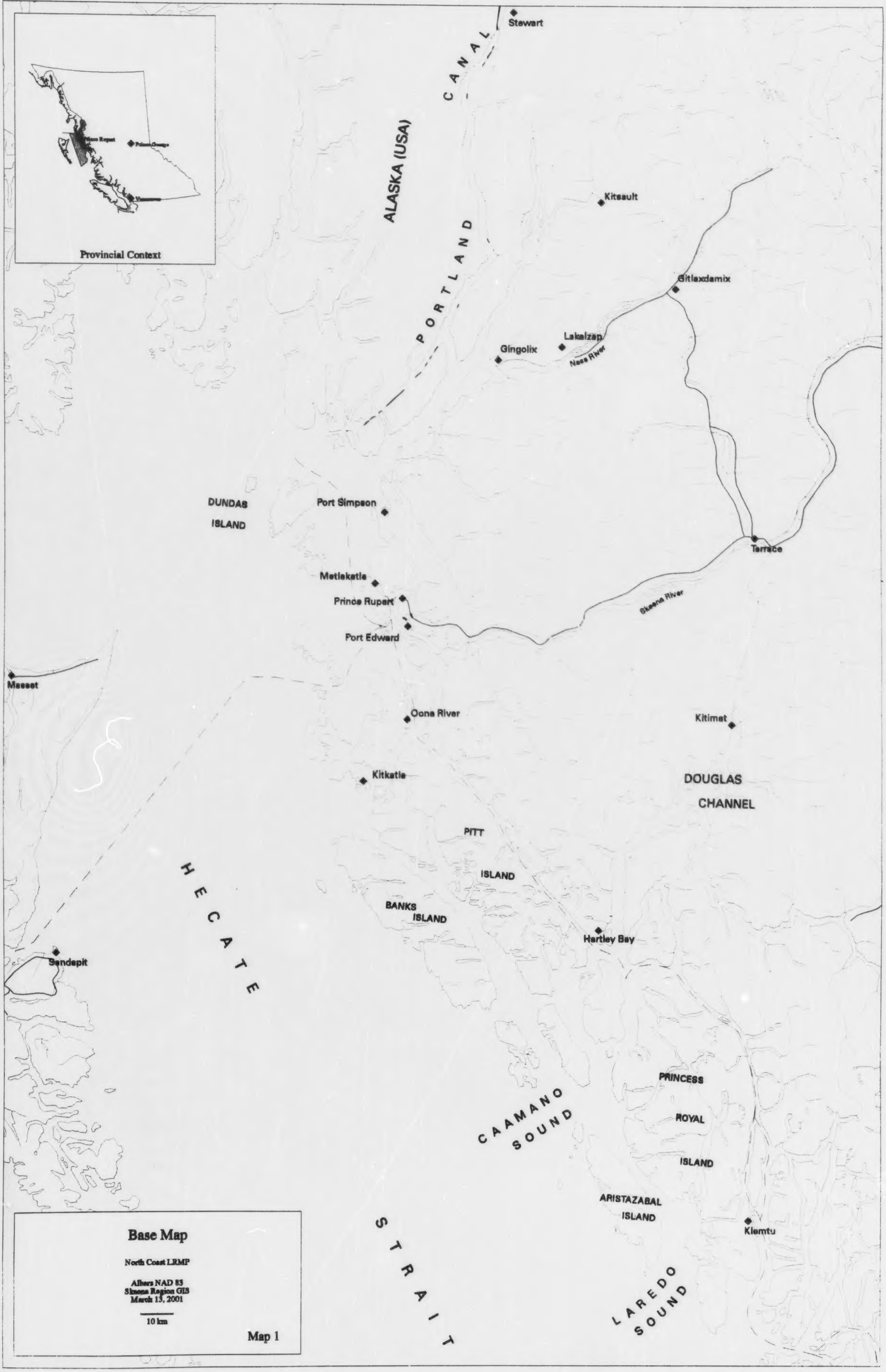
[1] Note: The term "potential climax vegetation" describes the more stable plant communities of later successional stages. The climax vegetation described for a zone may be different from what is currently growing on a site.


Provincial Context
Prince Rupert
Prince George
Vancouver
Stewart
PORTLAND CANAL
ALASKA (USA)
Kitsault
Gitlaxdamix
Lakalzap
Gingolix
Nass River
DUNDAS ISLAND
Port Simpson
Terrace
Metlakatla
Prince Rupert
Skeena River
Port Edward
Masset
Oona River
Kitimat
Kitkatla
DOUGLAS CHANNEL
PITT ISLAND
BANKS ISLAND
Hartley Bay
HECATE STRAIT
Sandspit
PRINCESS ROYAL ISLAND
CAAMANO SOUND
ARISTAZABAL ISLAND
Klemtu
LAREDO SOUND
Base Map
North Coast LRMP
Albers NAD 83
Skeena Region GIS
March 13, 2001
10 km
Map 1

province to each other. These lower levels divide the province based on areas of similar climatic processes, physiography, and wildlife potential (Meidinger and Pojar, 1991).

The BEC system and Ecoregion Classification system are compatible and are often integrated for land use planning purposes. For example, the two systems are combined to produce Broad Ecosystem Classification mapping, also called Broad Ecosystem Inventory. Broad Ecosystem Classification uses information on dominant vegetation cover or distinct non-vegetation cover to determine the function and distribution of plant communities in a landscape. Broad Ecosystem mapping is used to derive interpretive maps of habitat suitability and capability for wildlife (see S 3.2.1 Terrestrial Wildlife: Assessing habitat values).

The LRMP area overlaps with one ecoprovince, three ecoregions and seven ecosections (Table 1; Map 2). The ecosection descriptions that follow have been modified from RPAT (1996) and Demarchi (1996) to provide details specific to the North Coast LRMP area.

Table 1. Ecoregion zones within the North Coast LRMP area.

Ecoprovince	Ecoregion	Ecosection
Coast and Mountains	Northern Coast and Mountains	BOR (Boundary Ranges)
		APM (Alaska Panhandle Mountains)
	Coastal Gap	HEL (Hecate Lowland)
		KIR (Kitimat Ranges)
	Hecate Continental Shelf	DIE (Dixon Entrance)
		HES (Hecate Strait)
		QCS (Queen Charlotte Sound)

Boundary Ranges Ecosection (BOR): A tiny portion of the southern tip of the Boundary Ranges ecosection is found at the northern extreme of the North Coast LRMP area. This ecosection is characterized by rugged glacier capped granitic mountains. In fact, the entire portion of this ecosection within the plan area is beneath the Cambria Icefield.

Alaska Panhandle Mountains Ecosection (APM): The Alaska Panhandle Mountains ecosection forms the northern section of the North Coast Planning area, surrounding Portland and Observatory inlets. The mountains in this ecosection are part of the Boundary Ranges, but tend to be slightly lower in elevation. The climate is coastal, due to the presence of long inlets that bisect the ranges as far north as the Cambria Icefield.

Hecate Lowland Ecosection (HEL): The Hecate Lowlands ecosection is the westernmost land-based ecosection within the planning area. This coastal lowland and island archipelago area has been heavily glaciated as indicated by large areas of glacially abraded, exposed bedrock. The landscape is rough, but elevations, for the most part, remain below 650 meters.

The climate is dominated by frontal systems from the Pacific Ocean moving over the area and lifting over the mountains to the east. While there is heavy windward rainfall, it is less intense than in other coastal stretches due to the lower Coast Mountain barrier.

The Kitimat Ranges Ecosection (KIR): The Kitimat Ranges is the mountainous portion of the Coastal Gap Ecoregion. This ecosection includes both the windward and the leeward slopes of the Kitimat Ranges. While this portion of the coast receives the greatest frequency of frontal weather systems, the relatively low Coast Mountain barrier and the long fjords allow some of the moist coastal air to flow eastward to the interior, thereby reducing the overall precipitation.

Dixon Entrance Ecosection (DIE): The Dixon Entrance is the northernmost ecosection within the Continental Shelf Ecoregion. It is a deep trough located between northern Graham Island and islands to the north which form the Alaska panhandle. It extends east to the entrance of Portland Inlet. The area is characterized by strong freshwater influences from the Skeena and Nass Rivers that drive a coastal buoyancy current and estuarine-like circulation system. This ecosection generally has depths of less than 200 m, gentle subsurface relief, low currents, and sand substrates. Dixon entrance is an important migratory corridor for salmon.

Hecate Strait Ecosection (HES): The Hecate Strait Ecoregion is a very shallow strait separating much of the Queen Charlotte Islands/Haida Gwaii and the mainland coast. The deepest section is located near the shore of the mainland. Bottom sediments are primarily coarse. Although this area is semi-protected, a combination of strong tidal currents and rough conditions, partially due to the shallowness, promote mixing of water.

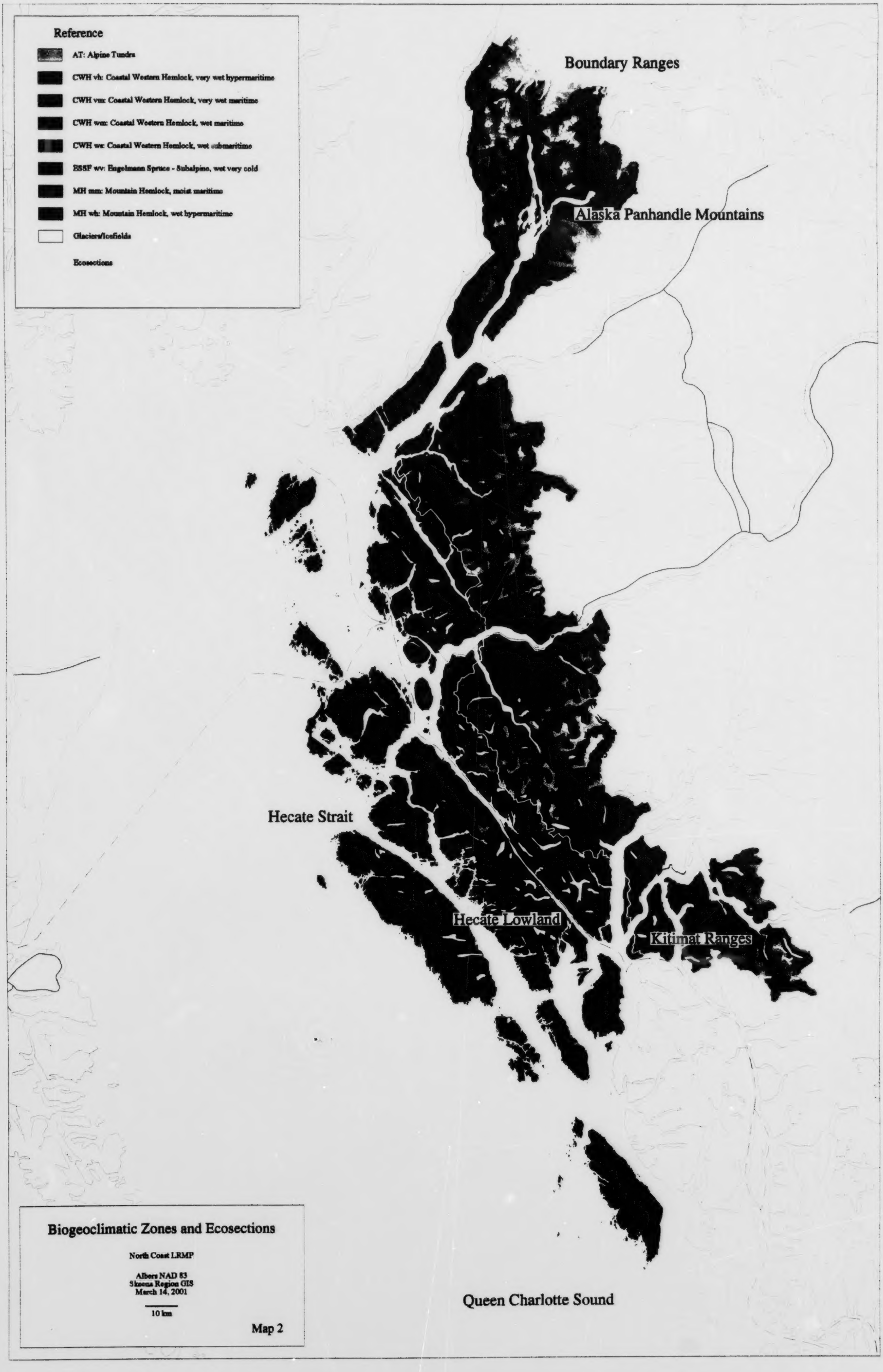
Queen Charlotte Sound Ecosection (QCS): The Queen Charlotte Sound ecosection, located south of HES, separates the remainder of the Queen Charlotte Islands/Haida Gwaii from the mainland. It is a deeply dissected shelf area with several large intervening banks. Oceanic waves extend into this area allowing oceanic water intrusions.

2.2 Social and Economic Description

2.2.1 History of the area

The North Coast area has been home to First Nations civilizations for tens of thousands of years. Long before the Europeans arrived in the area, the harbour that is now known as Prince Rupert was the most densely populated area north of Mexico (PRVIC, 1999). The First Nations communities along the coast were prosperous and flourished with the abundance of food and life-supporting materials. This prosperity enabled the development of a sophisticated and complex culture, including intricate and unique works of art, story telling and dance.

Because coastal areas were more readily accessible in the days before roaded access, there is a long history of First Nations and European settlement along the coast. Early interactions between the First Nations and Europeans involved the fur trade. Trading ships moved through the area in increasing numbers during the mid- to late-1800s.


Reference
AT: Alpine Tundra
CWH vh: Coastal Western Hemlock, very wet hypermaritime
CWH vm: Coastal Western Hemlock, very wet maritime
CWH wm: Coastal Western Hemlock, wet maritime
CWH ws: Coastal Western Hemlock, wet submaritime
ESSF wv: Engelmann Spruce - Subalpine, wet very cold
MH mm: Mountain Hemlock, moist maritime
MH wh: Mountain Hemlock, wet hypermaritime
Glaciers/Icefields
Ecosections
Boundary Ranges
Alaska Panhandle Mountains
Hecate Strait
Hecate Lowland
Kitimat Ranges
Queen Charlotte Sound
10 km

Biogeoclimatic Zones and Ecosections

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

Map 2

By the late 1800s there were numerous small native and non-native communities along the coast established for fishing, canneries, and mining development. In 1896, the discovery of placer gold in the Klondike, in the Yukon, sparked a "rush" that brought thousands of prospectors up the coast. Some headed to the gold fields; others prospected in Northern British Columbia, looking for the next big discovery.

Over time, as patterns of resource use shifted and people drifted to more populated centres, many of these outlying communities disappeared. One such town, Anyox, was built in 1911 to house workers at the mine and smelting operations. At its peak the town, located at the head of Observatory Inlet, had a population of around 3000 residents and boasted a modern hotel, a school, 3 churches, an 18 bed hospital, several stores, a movie theatre and a recreation hall. A sawmill and brickyard were located on the outskirts of the town. Low copper prices in the depression forced the main mine and smelter to close in 1935 and by 1942 the town was deserted.

At the turn of the century, the city of Prince Rupert was established as the western terminus for the Grand Trunk Pacific Railway. The president of the railway, Charles Melville Hays, had a dream of creating a showpiece town at the end of the rail line. Leading architects were invited to submit plans for this planned city. Hays traveled throughout Canada and to England to promote his venture and encourage settlement. He died on the return trip from England, where he and his family were guests of the White Star Line on the RMS Titanic.

Despite Hays' untimely death, the Prince Rupert continued to grow. Fishing became the mainstay of the economy, with a thriving salmon fishery at the mouth of the Skeena River and later fisheries for halibut and herring. Over the years approximately 38 canneries have operated in the area. The town became a strategic port during World War II for troops and materials en route to the Pacific. Over 50,000 Canadian and US troops passed through during that period and the entire town was fitted for war, with a seaplane base, new docks, a military hospital and a road inland to Terrace. These wartime amenities jump-started the area into a prosperous post-war period.

In 1949 the first pulp mill was built in the area, bringing in workers to harvest timber and work in the mill. The development of the Port of Prince Rupert in 1972 further diversified the economy, making the area a key transportation link between North America and the Pacific Rim.

2.2.2 Communities

The communities of the North Coast are all associated with the sea. Most of the smaller communities are remote and are accessible only by air or water. There is a strong tradition of commercial fishing in all communities.

Most of the small coastal communities outside of Prince Rupert are First Nations villages. Map 3 gives an overview of the current land status of the plan area, including private land, Indian reserves, community watersheds, and existing parks. Approximately 20,100 people lived in the North Coast LRMP area in 1996 (MOF, 1998b). Over 80% of the population live in Prince Rupert.

Table 2 shows population trends in communities of the plan area over the past 20 years. The population of Prince Rupert has been relatively stable with only minor fluctuations. After a big drop in population between 1981 and 1986, the population of Port Edward has also stabilized. There have been large fluctuations in the populations of the more remote First Nations communities over time. This can be explained, in part, by people moving on and off reserve for employment.

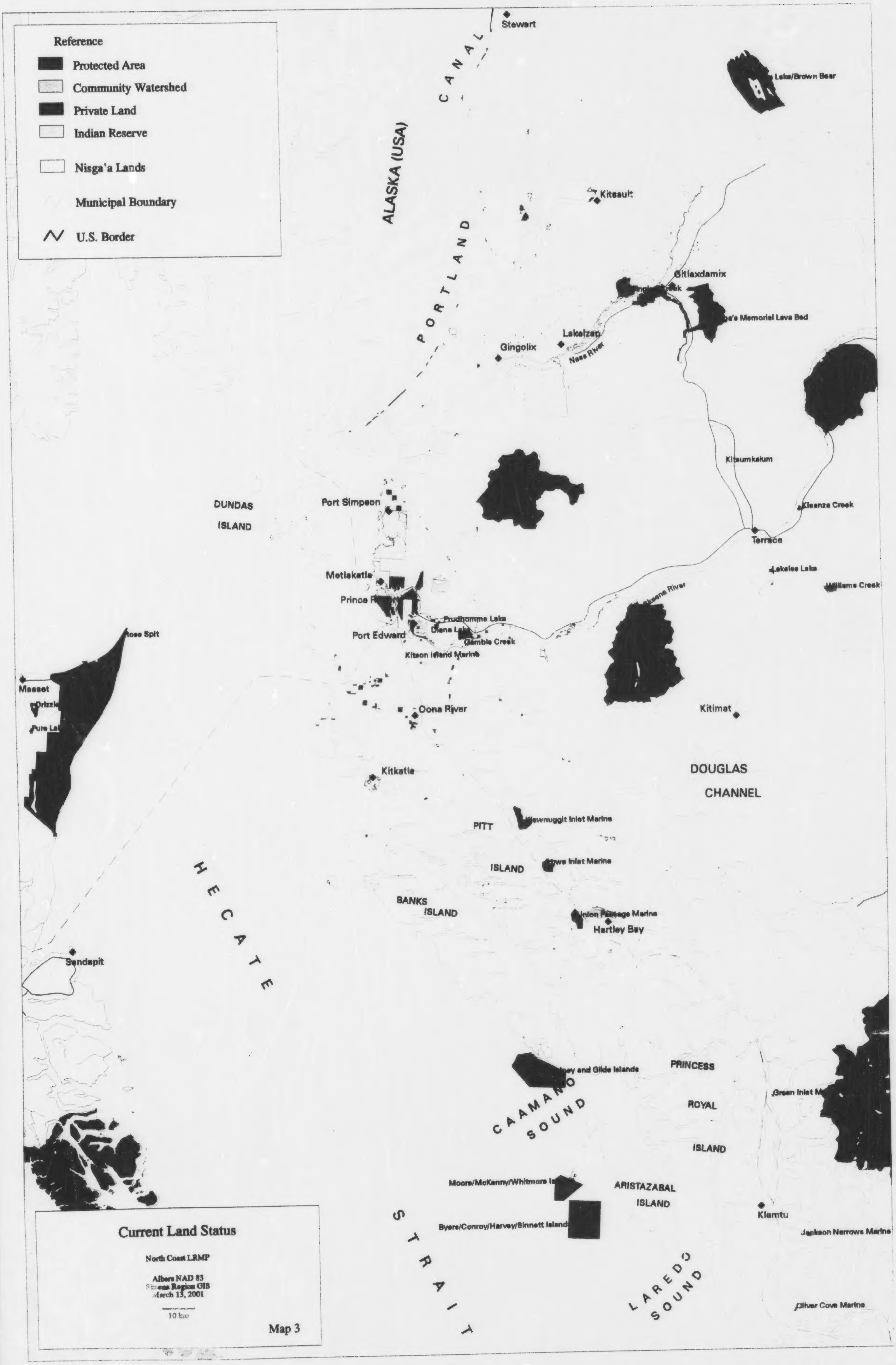
Table 2. Communities in the North Coast: population trends since the 1980s.

Year	Prince Rupert	Port Edward	Metlakatla	Lax Kw'alaams	Kitkatla	Hartley Bay
1981	16,652	1018	-	-	-	-
1986	16,318	731	344	553	421	214
1991	17,098	761	129	785	327	185
1996	17,432	732	140	879	451	155
1999	16,985	772	-	-	-	-
% change 1981 - 1999	1.9%	-24.2%	-	-	-	-
% change 1996 - 1999	-2.6%	5.5%	-	-	-	-
% change 1986 - 1996	-	-	-59.3%	59.0%	7.1%	-27.6%

Sources: BC Stats, 1999c; NWCC, Other communities not mentioned in Table 2 include Dodge Cove, off of Prince Rupert (1996 population: 113) and Oona River and Hunt's Inlet on Porcher Island (1996 population: 45). 1995

Although the Nisga'a communities of Kincolith and Lakalzap (Greenville) are within the boundaries of the North Coast Forest District, these communities are part of the Nisga'a Settlement Lands and are therefore outside of the LRMP. However, the Nisga'a continue to have an interest in the plan area. The populations of Nisga'a in the communities of the Nass River valley was 2500 in 1995 (Nisga'a Tribal Council, 1995).

Most of the communities within the North Coast lie within the Skeena-Queen Charlotte Regional District (SQCRD). The Regional District includes the mainland and islands adjacent to Prince Rupert and the Queen Charlotte Islands/Haida Gwaii. The portion of the Regional District in the LRMP includes Prince Rupert and area, Port Edward, nearby rural islands and several native villages, including six First Nations inhabited reserves. The total population of the SQCRD is 24, 294. Part of the LRMP area is also in the Regional District of Kitimat-Stikine.



Current Land Status

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

Map 3

2.2.2.1 Prince Rupert

Prince Rupert is located on Kaien Island, near the mouth of the Skeena River. It is the administrative hub of the LRMP area and the largest community in northwestern British Columbia with a population of 16,985 in 1999 (BC Stats, 1999a).

Much of the character of Prince Rupert comes from its proximity to the ocean. The Port of Prince Rupert is the third largest ice-free harbour in the world and one of the largest natural deep-sea harbours (Dolan, 1995). The city is the terminus for B.C. Ferries travelling to Port Hardy and the Queen Charlotte Islands/Haida Gwaii and a stopover for ferries on the Alaska Marine Highway traveling north. Prince Rupert is also the port of call for a number of cruise ships travelling to and from Alaska. Proximity to the Pacific Rim and Asian markets makes the city a desirable shipping location. There are four shipping facilities, the largest being Fairview Terminal, owned by the Port of Prince Rupert. Docks filled with fishing and pleasure boats line the waterfront. The city is also the western terminus of the CN Rail Northern Trans-Continental Line. The rail line links with shipping and ferries as well as transporting passengers and local commodities.

The labour force of the city was 9240 in 1996 (BC Stats, 1999a). A large number of people are employed in the public service or in trade professions (e.g., construction, and manufacturing). Employment in the area is heavily resource-oriented, with fishing and forestry both playing significant roles in the regional economy.

There were five fish processing plants in Prince Rupert in 1995 and another 13 in the surrounding area (NWCC, 1995). Forestry is an important employer, both in the harvesting and processing of timber. The Skeena Cellulose pulpmill and the West Fraser lumber and chip mills provide jobs for approximately 850 people (MOF, 1998b). Tourism is a growing sector, with a focus on waterfront development and capitalizing on the area's natural, recreational and cultural amenities (Mrozewski, 1998; PREDC, 1998). Shipping, transportation and storage provide a number of jobs. Prince Rupert is the main supply center for the coastal region. Many people come to the city from outlying areas to buy supplies and seek employment. In 1996, the unemployment rate for the city was approximately 16% (BC Stats, 1999a), which compares to a provincial unemployment rate of 9.6%.

There are eleven schools in the Prince Rupert area, including two secondary, eight elementary schools, and an alternate school for adolescents. Thirty-nine percent of the labour force in Prince Rupert have less than full high school education (PREDC, 1999a), compared to 33% in B.C. as a whole in 1996 (BC Stats). The level of education is increasing as employment opportunities for unskilled labour (e.g., in the fishing industry) declines and people upgrade their education to broaden their marketable skills (PREDC, 1999a). Northwest Community College is based in Prince Rupert, providing courses in trades, business, and basic education and skills training. The University of Northern British Columbia also has a satellite campus in the city.

The city has a number of amenities, including a hospital and range of medical services, a golf course, aquatic center, civic center, and a number of museums, including the Museum of Northern British Columbia, the Kwinitsa Station Railway Museum, and the Firehall Museum.

2.2.2.2 Port Edward

The District of Port Edward is located 15 kilometres south of Prince Rupert. The townsite lies along Inverness Passage and is linked by road to Highway 16. The population of the town was 772 in 1999 (BC Stats, 1999b).

The District covers a large area (18,387 ha) of predominantly undeveloped forested land and includes an ecological reserve, two provincial parks (Prudhomme Lake Park and Diana Lake Park) and a major historical site at North Pacific Cannery.

Most of the residents of this community are employed in the manufacturing associated with the fishing and forestry industries. The Skeena Cellulose pulpmill, located in Port Edward, provides employment for large numbers of local residents, including people from Prince Rupert. Fishing charters and the North Pacific Cannery Village Museum also provide local employment. A high proportion of the residents (57% in 1990) commute to Prince Rupert for work and some work at nearby Ridley Island at the coal and grain terminals (Clouston, 1995a).

2.2.2.3 Tsimshian Communities

Metlakatla

Metlakatla is a small community located at the south end of the Tsimpsean Peninsula, 5 km by boat from Prince Rupert. The village began as a religious community in 1862, led by the lay Anglican minister, William Duncan. Following a dispute with the Anglican church, Duncan and half of the community moved to Alaska and established a second Metlakatla outside of Ketchikan. The name Metlakatla comes from a Tsimshian word meaning "a passage connecting two bodies of salt water."

The Metlakatla Band Council oversees 16 reserves comprising 162 hectares. Approximately 102 people from the Metlakatla Band lived in the community in 1995. 434 members of the Band lived off reserve e.g., in Prince Rupert, returning to the reserve at various times of the year (Clouston, 1995b).

Most of the working residents in Metlakatla are employed seasonally in commercial fishing, either on fish boats or at fish processing plants in Prince Rupert. There are a number of other commercial ventures underway, including aquaculture and tourism.

There are no schools in Metlakatla and students attend classes in Prince Rupert.

Lax Kw'alaams (Port Simpson)

Lax Kw'alaams is located at the north end of the Tsimpsean Peninsula. The community was established as a Hudson Bay post in 1834. Access to the community is by air, water and road. The village is connected by road to Tuck Inlet, from which a ferry to Prince Rupert runs twice a week.

There were 1050 on reserve residents in Lax Kw'alaams in 1995. A further 1360 members of the Lax Kw'alaams Band lived off reserve (Clouston, 1995e). The Lax Kw'alaams Band Council administers 72 reserves covering 1050 ha.

The main sources of employment in the community are commercial fishing , forestry and administration. The community also runs a fish processing plant and roe-on-kelp operation.

Kitkatla (Gitk̲xwaala)

The village of Kitkatla is located off the southern end of Porcher Inlet, on Dolphin Island. The village is accessible by seaplane and boat. There are no ferry services. The Kitkatla Band Council administers 21 reserves on 1885 ha of land. The name Kitkatla comes from a Coast Tsimshian word meaning "people surrounded by water."

There were 405 people from the Kitkatla Band living on reserve in the community in 1995. Another 898 members of the band lived off reserve (Clouston, 1995c).

The main employers in Kitkatla are administration and commercial fishing for salmon, halibut and herring. Other employment is predominantly seasonal work in fish processing, roe-on-kelp, boat building, construction and salmon enhancement. There are also some self-employed wood carvers. The Lach Klan School provides education from Kindergarten to Grade 10. There were 106 students in 1994 (Clouston, 1995c). In 1995, 51% of the population living on reserve was under 14 years of age (Clouston, 1995c).

Hartley Bay (Gitga'at)

Hartley Bay is located 144 km south of Prince Rupert at the confluence of the Greenville and Douglas Channels. The Gitga'at First Nation manages 14 reserves totaling 520.3 hectares. Hartley Bay village is located on Kulkayu Indian Reserve No. 4 and 4A. Access to the community is limited to float plane and boat.

The population of Hartley Bay in 1998 was 601. Of these, 182 were living full-time on reserve, with another 419 living off reserve (mostly in Prince Rupert) and migrating to and from the reserve at various times of the year (MEI, 1999). In 1995, 59% of the population was under 25 years of age (Clouston, 1995d).

Most of the working residents in the community are employed in commercial fishing or the administration of various programs. There are various other enterprises in place, including a salmon enhancement project and roe-and-kelp operation. A number of people are self-employed as carvers.

The Hartley Bay School provides education from Kindergarten to Grade 10. There were 52 students in 1994 (Clouston, 1995d).

2.2.2.4 Dodge Cove

Dodge Cove is a small community on Digby Island, a short ferry ride from Prince Rupert. There is talk of building a bridge to connect the island to Kaien Island, thereby providing more ready access to the airport, located on the west side of the island.

2.2.2.5 Oona River

This small community of Scandinavian origin is located on Porcher Island. Most of the population of approximately 35 is employed in commercial fishing, logging and boat building. There is a one-room school and a small sawmill. There are a number of recreational cottages in the community, owned primarily by people from Prince Rupert.

2.2.2.6 Kitsault

The town of Kitsault is located near the head of Alice Arm, on the site of the abandoned community of Silver City. Silver City was established by prospectors in the early 1900's, but gradually died with the development of the town of Alice Arm, which lay closer to the developing silver mines.

Kitsault was built to house employees of the Amax mine, a major molybdenum mine that operated from 1967 to 1972 and briefly again in 1981 to 1982. Over 106 houses, several apartment buildings, a full recreation center, store and marina were constructed. Today the townsite is uninhabited with the exception of a caretaker and a handful of seasonal employees who maintain the site. The mine and mill facilities have largely been reclaimed and rather than sell the town piecemeal, the company is trying to sell it as one package.

2.2.2.7 Alice Arm

This former mining town currently functions as a seasonal retirement and summer vacation community, with only one family resident year round. Though small and currently providing no services, the community is undergoing some recent growth - new homes are being constructed and there is potential for growth in tourism and possible mine development.

2.2.2.8 Other communities with an interest in the plan area

The town of Stewart is located just outside of the plan area, at the end of the Portland Canal. Stewart acts as a service center for mining in northwestern British Columbia. Most of the mineral exploration and mine development projects in the north portion of the plan area are serviced from the town. Some roads still exist from Stewart to past mines. Although Stewart itself is not within the boundaries of the LRMP, its residents may be impacted by the results of strategic planning for the LRMP. Stewart and area, as part of the Kalum Forest District, will eventually be included in a Nass LRMP process, should one occur.

The First Nations communities of Klemtu, Kitamaat and Kitwancool also have an interest in the plan area (see Section 2.2.5: First Nations).

2.2.3 Economy and employment

The North Coast has one of the most diversified resource economies in northern British Columbia, supported by fishing, forestry, resource-related manufacturing, port services, tourism and the public sector (see Figure 1). Currently, the largest employer in the North Coast Forest District is the public sector, providing 30% of the employment in 1996 (MOF, 1999). The City of Prince Rupert is the main administrative and service center for the region. Primary resource industries (fishing and forestry) are the key private sector contributors to the local economy. Transportation and tourism are also significant and growing sectors. Agriculture, high technology, and mining are currently minor contributors to the economy, although there is a good probability of mining and high technology contributing more significantly to the economy in the future.

Table 3 provides a summary of employment statistics for the main population centers of Prince Rupert and Port Edward. There is a notable imbalance in the employment levels in the plan area, with moderate unemployment in the main centers and extremely high unemployment in the outlying communities, where the unemployment rate exceeds 80% in some places (PRDCC, 1999).

Table 3. Economic statistics for the North Coast LRMP, 1996.

	Prince Rupert	**Port Edward**	**LRMP area**	**B.C.**
Population	16,985	772	20,100	4,029,253
Labour force	9240	390	9972	1,960,660
Unemployment Rate	16.3%	21.8%	16.5% (Skeena-Queen Charlotte Regional District)	9.6%
Average income (1996)	$36,812	$33,047	$27,146	$36,961

Sources: BC Stats, 1999a; 1999b; Horne, 1999

The economy of the North Coast is tied strongly to economies outside of the region. A very high percentage of the wood harvested in the North Coast TSA, for example, leaves the area to be processed in Terrace, Vancouver Island, and the Lower Mainland. The port facilities in Prince Rupert are dependent on the markets for commodities such as coal and grain that are shipped from outside of the area. Much of the tourism traffic to the area is part of an overall northwest tourism experience, with the North Coast being one port of call. The tourism industry is sensitive to external factors such as trends in preferred travel experiences and the change in the value of the Canadian dollar.

Currently the economy in the plan area is in a tremendous state of change. It is difficult to provide an up-to-date picture of the current situation because the changes in many sectors have been so rapid and so profound. One of the biggest changes is the reduced significance of fishing as a contributor to the local economy since 1996. Tables 4 and 5 summarize aggregate economic and income statistics for the North Coast Forest District based on 1996 Statistics Canada figures.[2] These figures may not accurately reflect the situation in 2000; however, the tables do provide a picture of the relative significance of each sector to the local economy.

The numbers for the forestry sector, as shown in Tables 4 and 5, include employment that relies on timber harvested from the North Coast Timber Supply Area (TSA) Tree Farm Licence 25, and elsewhere. The term "other" in the first column includes basic industries such as manufacturing that are not otherwise classified. Note that figures for "transportation" are shown in Table 5, but are included in the "other" category in Table 4.

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[2] These figures closely approximate those for the North Coast LRMP area, although communities Nisga'a settlement lands are included in the data.

Table 4. Basic sector employment estimates[a] (including Indian Reserves), 1996.

	Number of jobs	**Basic sector employment (%)**
Public sector	2413	29%
Fishing and trapping[b]	1985	24%
Forestry (mostly pulp industry)	1653	20%
Tourism	1256	15%
Construction	372	5%
Agriculture	56	0.7%
Mining/ oil and gas	27	0.3%
High technology	24	0.3%
Other	410	5%
Total basic employment	8196	
Non-basic employment[c]	1776	
Total	9972	

a. Note, the percentages shown above reflect each sector's share of an area's total employment, including direct and indirect employment.

b. Trapping is a minor component of this grouping

c. Basic employment consists of those resident jobs that result in personal income flowing into the North Coast from outside of the area. Non-basic employment refers to those resident jobs that occur due to the spending of basic income in the local area (e.g., on local goods and services)

Source: Horne, 1999

Figure 1. Employment dependencies in the North Coast LRMP area, 1996

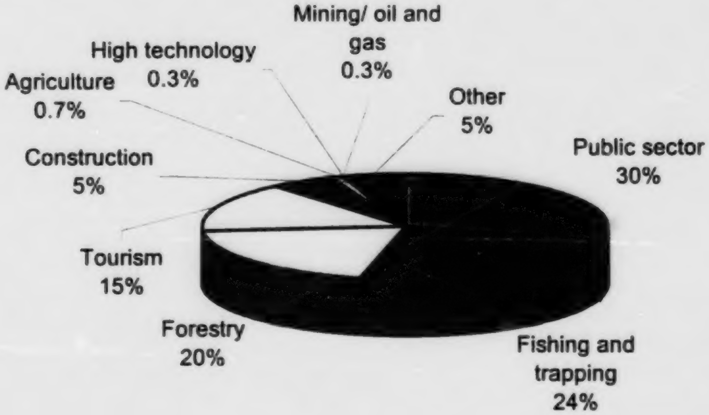
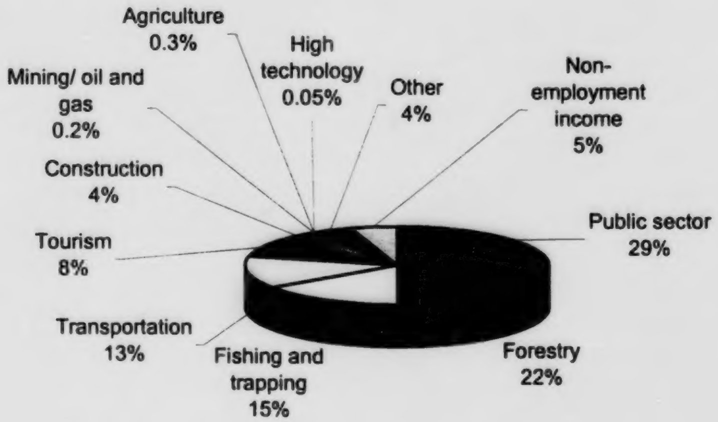


Table 5. After tax income estimates[3] (including Indian Reserves), 1996.

	Income ($000,000's)	Income from basic employment (%)
Public sector	63.8	27%
Forestry (mostly pulp industry)	51.5	22%
Fishing and trapping	35.7	15%
Transportation	31.2	13%
Tourism	19.6	8%
Construction	8.9	4%
Agriculture	0.8	0.3%
Mining/ oil and gas	0.4	0.2%
High technology	0.1	0.05%
Other	9.8	4%
Non-employment income[4]	11.6	5%
Total basic employment	233.3	
Non-basic employment	37.4	
Total	270.7	

Source: Horne, 1999

Figure 2. After-tax income by sector: North Coast LRMP area, 1996



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[3] Note, the percentages shown above reflect each sector's share of an area's personal income, including direct and indirect employment income.

[4] Non-employment income refers to income associated with investments, pensions, unemployment insurance, and social assistance payments

2.2.3.1 Commercial Fishing

The fishing industry in the North Coast area is currently experiencing a period of huge change. Once the mainstay of the economy, the fishing fleet and associated employment in processing, supplies and transport and handling has declined markedly over the past decade. This is due to a number of factors, including fleet management reforms, sectoral allocation issues, interception issues, world-wide price competition from farmed salmon, and climatic and environmental conditions resulting in reduced fish populations (see Section 4.6: Fishing).

In 1997, the overall value of commercially landed ocean fish including wild and farmed salmon, halibut, groundfish and herring in B.C. was $594 million (The Daily News, 1999).

Salmon fishery

Since 1996, Fisheries and Oceans Canada has reduced the size of the Pacific salmon commercial fleet through the 1996 Pacific Salmon Revitalization Strategy ("Mifflin Plan") and the 1998 Canadian Fisheries Adjustment and Restructuring Program (Government of Canada, 1999).

In 1996, as part of the Mifflin Plan, the federal government introduced a buyback program that reduced the salmon fleet by approximately 20%. The fleet was reduced a further 20% through changes to commercial salmon licences, including area licensing, single gear licensing and licence stacking (Province of BC, 1996). Since then, there have been two rounds of voluntary licence retirements, representing a balanced reduction across all gear types (Government of Canada, 1999).

Overall, these measures reduced the number of commercial salmon licences from 4112 in 1996 to 2557 in 1999 (Government of Canada, 1999). Despite these reductions, the salmon catches remained virtually identical between 1995 (48,600 tonnes) and 1997 (48,400 tonnes). Both these catches are down significantly from the peak in 1985-1990 when catches averaged about 92,000 tonnes per year (Gislason et al., 1998). Low salmon returns between 1995 and 1997 contributed to poor catches. The combination of low catches and poor prices, due to an oversupply of salmon on the world market, resulted in the landed value of salmon in the province falling to their lowest levels since DFO began making estimates 50 years ago (*Ibid.*).

Statistics on the fishing industry are provided for the North Coast (Fisheries) Region, which extends outside of the LRMP area to include Terrace, Kitimat, and Hazelton. In 1997, 1846 people were employed in the North Coast Region commercial salmon fishery. This includes jobs in processing, transportation, and supply. 1140 jobs were lost in the Fisheries Region between 1995 and 1997 (Gislason *et al.*, 1998). From 1995 to 1997, 275 jobs, or 25% of the positions within the salmon fleet were lost. Prince Rupert suffered the biggest loss, at 42% (Gislason *et al.*, 1998).

First Nations communities have been among the hardest hit by reductions in the fishing fleet, since commercial fishing has traditionally been one of the main employers in these communities. The cuts in the salmon fleet resulted in a 10% drop in the number employed in Hartley Bay and 5% in Kitkatla (Gislason et al., 1998). However the number of fishing jobs increased in Lax Kw'alaams and the Nass Valley as a result of a reallocation of licences by the Northern Native Fishing Corporation following implementation of the Mifflin Plan.

Recognizing the vulnerability of fisheries-dependent communities to major changes in the industry, the federal government introduced the Pacific Fisheries Adjustment and Restructuring Program (PFAR) in 1998. Programs funded by PFAR include selective fishing, voluntary salmon licence retirement, and retraining and business development including support to recreational fishing operators. Aboriginal communities will have access under PFAR to additional funding to provide adjustment programs and employment assistance (Government of Canada, 1999).

Non-salmon fishery

Non-salmon species, including halibut, herring, and crab, are also a significant part of the local fishery. Approximately 12% of the halibut licences and 7% of the herring roe licences in B.C. originate out of North Coast communities (Province of B.C., 1998). All of the First Nations communities in the area have roe-on-kelp licences.

2.2.3.2 Fish processing

Fish processing provides employment throughout the plan area. There are more than three times the number of people employed in fish processing as there are in commercial fishing (PREDC, 1998). As of 1998, nineteen fish processing plants were operating in the North Coast Region (Province of B.C., 1996), including five in Prince Rupert. The processing plants prepare fresh, frozen fish and canned fish. The BC Packers plant in Prince Rupert is the largest salmon cannery in BC (PREDC, 1998).

The downturn in the salmon fleet has also affected employment in fish processing. Almost half of the fish processing jobs were lost between 1995 and 1997, with a reduction from 1540 to 800 in the number employed in the North Coast Region (Gislason *et al.*, 1998). One of the strategies for economic diversification in the Prince Rupert area is to create more value-added seafood products (PREDC, 1998).

2.2.3.3 Aquaculture

There are currently no salmon-farming operations in the plan area and no vacant tenures. The Prince Rupert and District Chamber of Commerce estimates that the North Coast has the potential to provide 4000 direct and indirect jobs, including processing, transport and supply (PRDCC, 1999a).

There is one shellfish-farming operation in the plan area. The Humpback Oyster Farm is located on Porcher Island. Funded by the federal Community Economic Adjustment Initiative, it is the first operation of its kind on the North Coast (Sokoloski, pers. comm.). Several small shellfish pilot projects are underway within the planning area (Heath, pers. comm.; Dobie, pers. comm.). In addition, one of two proposed sites for abalone farms has been licenced (Dobie, pers. comm.). These farms may begin operating on-site in the year 2000 (Sokoloski, pers. comm.). A kelp-farming operation is also in the planning stages. See section 4.6: Aquaculture, for more details on aquaculture in BC and in the North Coast plan area.

Another project funded under the Community Economic Adjustment Initiative is the North Coast Biotoxin and Water Quality Program. The program is developing a monitoring system to assess the level of biotoxins in the water to potentially allow an increased period for harvesting of wild shellfish (Sokoloski, pers. comm.).

2.2.3.4 Forestry

Forestry provides employment in a variety of areas, including timber harvesting, road building, transportation (log barging, towing and sorting), timber processing (milling, pulp manufacturing, and value-added), silviculture, export log preparation and loading, and equipment supply and maintenance.

Table 6 shows trends in forestry employment over the last decade based on Census of Canada figures[5] and an annual mill survey conducted by Ministry of Forests Economics and Trade Branch. The figure shown for employment in logging and forestry services in 2000 is an estimate. Timber processing refers to employment in a range of operations (pulp and paper, sawmill, chip, and value-added).

Table 6. Estimates of employment for North Coast Forest District, 1991 - 2000.

Activity	**Year**		
	1991	**1996**	**2000**
Logging and forestry services	210	245	150 (est)
Timber processing	750	848	760
Total	**960**	**1093**	**910**

Source: Census of Canada (1991, 1996), MOF Economics and Trade Branch (1991, 1996, 2000)

The Allowable Annual Cut for the North Coast Timber Supply Area (TSA), set in 2000, is 573,624 m^3/yr. This represents approximately 6.3% of the total harvest allocated to TSAs and TFLs in the Prince Rupert Forest Region and 0.08% of the provincial AAC of 70.4 million m^3/yr. The projected Long Term Harvest Level for the North Coast TSA under current management is 338,000 m^3/yr (MOF, 1999).

Table 7 summarizes the relative allocation of timber harvest in the Prince Rupert Forest Region as of 2000. The figures for Block 5 of TFL 25 are not included in this calculation[5] (See footnote 5). The AACs shown in Table 7 reflect the permanent transfer of forested lands from Tree Farm Licence 1 and the North Coast, Kalum, and Nass TSAs to Nisga'a Lands. The Nisga'a Nation own the forest resources on the Nisga'a Lands. The annual harvest on the Nisga'a Lands during the initial five-year transition period will be up to 165,000 m^3/yr.

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[5] Note that Census of Canada data represents information about people whose principle residence is in the North Coast. As such, it does reflect the numbers of people who live outside of the area but come in to work e.g., loggers whose principle residence is in the Lower Mainland but who work in camps on the coast. It also does not reflect that some residents of the North Coast might work outside of the area.

Table 7. Summary of AACs for TSAs and TFLs in Prince Rupert Forest Region (2000)*.

Timber Supply Areas	**AAC (m^3/yr)**	**Regional AAC Share (excluding TFL 25)**
Bulkley	895,000	9.8
Cassiar	400,000	4.4
Kalum	436,884	4.8
Kispiox	1,092,611	11.9
Lakes	1,500,000	16.4
Morice	1,985,815	21.7
Nass	1,142,400	12.5
North Coast	573,624	6.3
Cranberry	110,000	1.2
Tree Farm Licences		
TFL1 (Kalum FD)	611,000	6.7
TFL41 (Kalum FD)	400,000	4.4
TFL 25 (Block 5)[6] (Nth Coast FD)	portion of 255,000	-
Regional total (excl. TFL 25)	**9,147,334**	**100**

* The AACs shown here exclude woodlot licenses that have been issued under the *Forest Act*

The full AAC in the North Coast TSA has not been harvested for several years, primarily due to high operating costs, depressed and/or highly variable sawlog and pulp log prices, and uncertainty related to international markets. According to the North Coast TSA Timber Supply Review (MOF, 1999), the average harvest from 1996 - 98 was 421,378 m3/yr, about 150,000 m^3/yr below the current AAC.

Table 8 provides a comparison of average stumpage revenues for Forest Districts (TSAs and TFLs) within Prince Rupert Forest Region in 1998. Despite an AAC that is 6.3% of the regional total, the stumpage revenues for the North Coast District are only 1.1% of the regional total. One cannot directly compare the stumpage revenue between the North Coast and the rest of the Forest Region because the North Coast is part of the Coastal Appraisal System while all other districts in the region are part of the Interior Appraisal System. However, the North Coast stumpage revenue is low for its AAC even compared to other districts appraised by the coastal system. This is because of various factors including the high costs of operating in such rugged and remote terrain, the distance of the harvested timber to processing facilities, and the lower quality of timber compared to other coastal areas (Silvestrini, pers. comm.). In recent years, stumpage rates have also been reduced for some operations due to stumpage calculations related to "blending cutblocks" and grade setting.

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[6] The AAC for TFL25 is 255,000 m^3. Only a portion of the TFL 25, Block 5, is in the North Coast Forest District. Because an accurate figure is not available of the portion of AAC allocated to Block 5, the AAC for this area has not been included in the regional total.

Table 8. Average stumpage revenues (TSAs and TFLs) for Prince Rupert Forest Region, 1998.

Forest District	Approximate stumpage revenue: Small Business (x 1000 $)	Approximate stumpage revenue: Other tenures (x 1000 $)	Total stumpage revenues (x 1000 $)	% of regional total
Bulkley-Cassiar	6665	8182	14,847	8.7
Kalum	3970	521	4490	2.3
Kispiox	5041	2927	7968	4.7
Lakes	24,385	35,257	59,643	34.9
Morice	6519	75,756	82,275	48.1
North Coast	1085	705	1790	1.1
Regional total	**47,664**	**123,349**	**171,013**	**100.0**

Source: MOF Revenue Branch, 1998c

Notes:

The "All Others" category includes all provincial Crown land except Small Business and timber licences

Figures include coniferous species, all grades and products except Christmas trees.

Figures exclude deciduous species, wasted and rejected.

Approximately 33% of the forestry employment from the AAC accrues to residents of the North Coast TSA. The remaining 66% accrues to other BC residents (MOF, 1994b). A significant number of logging jobs are held by employees working out of Terrace, Kitimat and Campbell River. In addition, a large amount of the timber harvest is shipped out of the area for processing e.g., to Vancouver, Terrace, Campbell River and Crofton. For example, International Forest Products, Ltd. (Interfor), which is allocated 38% of the Allowable Annual Cut for the North Coast TSA, does not have a local processing facility and coordinates the sale or trade of its North Coast harvest to other regional processors (MOF, 1999).

In 1999, the Government granted exemptions to West Fraser Mills, Ltd. (now Triumph Timber), International Forest Products Ltd., Boyle & Dean Logging Ltd. and Thomson Industries Ltd., to export a portion of specified timber parcels as whole logs to offshore locations (e.g., the United States, Japan, China, and Korea). This initiative was put forward by the Job Protection Commission to provide employment by encouraging licensees to operate in areas and harvest volumes that would not otherwise have been harvested due to the poor domestic markets and high local processing costs experienced in recent years.

Although a large amount of timber is exported from the plan area, there are also significant imports of fibre into the North Coast TSA, primarily to support operations at the Skeena Cellulose pulp mill in Port Edward.

Harvesting and silviculture

Most of the non-manufacturing forestry employment in the North Coast is associated with harvesting and silviculture activities in the central and southern portions of the plan area, where timber is more accessible and closer to processing facilities than in the more remote and rugged areas to the north.

The replaceable forest licences in the plan area are held by Interfor[7], Triumph Timber, Ltd[6]., Boyle and Dean Logging Ltd.[8], and Thomson Industries Ltd. [7] (see Section 4.2: Forestry). Table 9 shows the harvest and direct employment for each of the tenures in 1998, based on the 1995 AAC. Most of the harvesting by Boyle and Dean and by Thomson Industries occurred in 1993 and 1994 (MOF, 1999).

The Small Business Forest Enterprise Program, with an AAC 149,082 m^3/yr (based on the 1995 AAC) employs approximately 150 direct jobs per year[9].

Table 9. Harvest and direct employment statistics for replaceable Forest Licences, 1998.

Forest Licence	**1995 AAC (m^3)**	**1996 – 1998 average annual harvest (m^3)**	**Direct employment (person-years)**
Interfor	226,617	190,545	60 (Harvesting and Admin) 17 (Silviculture)
West Fraser Mills (now Triumph Timber)	161,449	175,310	18 (Harvesting and Admin) 10 (Silviculture)
Boyle and Dean Logging	20,156	0	0
Thomson Industries	30, 696	7421	5 (Harvesting and Admin) 4 (Silviculture)

Source: MOF, 1999. Excludes employment associated with SBFEP harvest.

A number of the First Nations communities are looking to become increasingly involved in forestry, particularly with the downturn in the fishing industry. The Lax Kw'alaams First Nation has been involved in harvesting, silviculture, and road-building for a number of years and, in 2000, was awarded a non-replaceable forest licence of 22,000 m^3/yr for 10 years.

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[7] The average yearly harvest will not necessarily equal the AAC. Harvests under licences with AACs greater than 50 000 m3/year may differ from the AAC by up to 50% annually but must average within 10% of the licence AAC over each five-year period.

[8] The harvest level for all licenses less than 50 000 m3/year is not subject to yearly cut control regulations but is based on achieving ± 10% by the end of a 5-year period.

[9] Based on a standard direct employment factor of 1 full-time equivalent job per 1000 m3 of timber.

Timber processing

There are two major wood processing facilities in Prince Rupert. The Skeena Cellulose pulpmill has the capacity to process 2.4 million m^3 of timber a year (MOF, 1994b). This equates to 450,000 tonnes of pulp, representing 5.6% of the share of pulp capacity in the province (Bridges, 1997).

Skeena Cellulose is one of two pulp mills operating in the Prince Rupert Forest Region (Eurocan [West Fraser] has a mill in Kitimat). Over the last ten years the Skeena Cellulose mill has undergone a number of upgrades, including measures to meet environmental standards. As of March 2001, approximately 600 people were employed at the mill, down from 750 in 2000 (Balland, pers. comm.).

Skeena Cellulose is not tied to any licence agreement in the North Coast TSA and most of the pulpwood for the facility comes from outside of the TSA. The mill receives pulp chips from mills in other districts in Prince Rupert Forest Region and from Alaska. It is also supplied by timber from the Small Business Forest Enterprise Program.

West Fraser Mills Ltd. operates a lumber and a chip complex in Prince Rupert. The facility is dual purpose; one line produces dimensional lumber while the other is a whole log chipper. The chipper processes approximately 35,000 m^3/year of small logs. The lumber mill processes about 150,000 m^3/year of larger timber (MOF, 1999). Wood chips from both lines supply the Skeena Cellulose pulpmill. The West Fraser mill supported approximately 35 direct jobs in 1998 (MOF, 1999).

The Ridley Island Log Sort Inc. facility is a multi-purpose facility that is involved with wood shipping and milling, and log trading and sorting. In the past year, the Log Sort has secured an agreement to supply Skeena Cellulose with 16,000 m^3/month of chipped wood. This has increased employment at the facility from 13 in 1998 to 22 in 1999 (MOF, 1999).

There is a small family operated sawmill called Group Mills at Oona River that employs a small number of people. The timber for the mill comes mostly from hand loggers operating locally. There are several other small timber processing facilities that buy logs from smaller local operators. Their products, often highly value-added, are sold locally or exported.

Other forestry employment

Marine transportation includes log barging, booming, and towing. In 1994 marine transportation supported 100 person-years of employment, a portion of which results from the movement of timber from the Kalum and Cassiar TSAs (MOF, 1994b).

Beachcombing for logs is a small income earner in outlying areas.

2.2.3.5 Transportation

Prince Rupert is British Columbia's second largest port. The city is ideally located to act as a major transportation center, being at the end of the rail line and highway and having a deep and ice-free harbour from which to ship materials around the world. It is the closest port to Asian markets on the west coast of North America, closer to Asian destinations than Vancouver by 30 hours (Goddard, 1998).

There are four shipping facilities in Prince Rupert: a pulp facility at Watson Island; grain and coal facilities at Ridley Island; and the Port of Prince Rupert's Fairview Terminal. There were 577 people employed in transportation and shipping in 1996 (PREDC, 1999). Prince Rupert Grain provides seasonal employment. The closure of Northeast Coast has place Ridley Terminal under economic stress.

The Port of Prince Rupert is currently considering several approaches to diversifying and expanding its facilities, including increasing bulk exports, container traffic and the cruise ship trade. In particular, the port is gearing itself to becoming a container port facility (Mrozewski, 1998). A $20 million facility to ship liquefied sulphur was approved for Prince Rupert in 1999. The new facility, owned by the Sulphur Corporation of Canada, will be situated near the existing coal port (PREDC, 1999b).

The Port of Prince Rupert also acts as the terminus for B.C. Ferries and the Alaska Marine Highway.

2.2.3.6 Tourism

Some of the key factors drawing tourism activity to North Coast are the area's exceptional scenic beauty, opportunities for wildlife viewing (including bears and whales) and other outdoor activities, the rich and diverse West Coast First Nations culture, and its position as an access point to other high profile tourism destinations (e.g., Queen Charlotte Islands/Haida Gwaii, Vancouver Island, and the Alaska Panhandle).

According to the Ministry of Finance and Corporate Relations (Horne, 1999) as of 1996, there were 1167 workers in the North Coast who indicated via the Census that the following tourism jobs[10] were their primary source of employment income, although a number would be part-time and/or seasonal:

- ☐ Food Services (restaurants, taverns, etc.): 457
- ☐ Accomodation Services (hotels, motels, campgrounds, lodges, B&B's, etc.): 314
- ☐ Retail Trade (consumer goods, groceries, auto repair, etc): 169
- ☐ Personal Services (cleaners, hair stylists, guiding, etc.): 88
- ☐ Recreation Services (golf courses, boat rentals, marinas, museums, etc.): 85
- ☐ Transportation and Other: (airlines, ferries, charters, port operations, etc.) 54

According to the 1995/96 British Columbia Visitor Study, 86% of BC residents and 81% of non-BC residents visiting the northwest area of the province were travelling for leisure (as opposed to business) purposes (MSBTC, 2000).

Almost all of the tourism activity in the plan area is based out of Prince Rupert. The city is developing its tourism infrastructure to encourage visitors arriving by air, land (via Highway 16 and the VIA Rail) and sea on the B.C. and Alaska ferries and on cruise ships (see Section

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[10] Note that not all of retail, food, and personal/recreation/transportation services are assumed to be tourism jobs – the estimates have therefore been adjusted by MFCR to "net out" the jobs in these sectors that are deemed to cater only to the expenditures of North Coast residents. All accommodation services are assumed to result from tourism, however. Also, some of these jobs would be dependent on business travellers.

4.4: Recreation, Tourism, and Visual Quality). In 1995, a total of 187,237 passengers embarked or disembarked from ferries in Prince Rupert (Province of BC, 1998). Tourism Prince Rupert estimates that 480,000 vehicles arrive or depart from the city via Highway 16 every year (Ferguson, pers. comm.). Between 1992 and 1999 an average of 1425 people a year visited the city on "pocket" cruise ships (Parkin, pers. comm.)

Recreational fishing

The recreational, or sports, fishery is a growing aspect of the fishing industry in the LRMP area. The fishery includes both fresh and salt water. Employment related to sport fishing includes guiding, accommodation (including fishing camps and lodges), transportation (including boat and plane charters) and retail outlets for fishing supplies.

There are over 80 marine fishing charter operations in the North Coast plan area, based mostly out of Prince Rupert (PRVIC, 2000). Most of these operations employ one to three people on a part-time, seasonal basis.

In 1990, the Skeena freshwater fishery (including areas upstream of the North Coast) generated approximately $10.4 million in local expenditures (ARA Consulting, 1991). This included 190 person-years of employment, $4.7 million in local wages and salaries, and $7.0 million in local value-added or income. 27% of this amount can be attributed to steelhead angling.

The sports fishing market has been affected by the declines in fish populations in recent years. One of the most highly sought after sports fish, coho, was closed to commercial and most recreational fishers in 1999. Reports of declines in salmon stocks has resulted in an average of 30% reduction in revenues to the sports fishing industry (PREDC, 1998).

Adventure tourism

There is currently one local business offering guided kayaking trips out of Prince Rupert. Other businesses include whale-watching, sailing charters, and dive charters.

2.2.3.7 Mining

Metallic and Industrial Minerals

Only one mineral mine is currently operating in the plan area. Since the mid-1980's, Tru-Grit Abrasives has been mining the former Anyox Smelter site, located at Observatory Inlet. The smelter slag pile is composed of devitrified glass, which is mined to produce a fine abrasive used for sand blasting. The quarry operates on a seasonal basis, from April to October, employing 3-5 persons.

A past producing marble quarry on Aristazabal Island is currently in the process of obtaining a mining permit. If production proceeds in 2001, roughly 35 persons will be employed by the operation.

As a result of low molybdenum prices, there are no immediate plans for re-opening of the Kitsault mine. However, a caretaker is employed year round at the townsite and a crew of 2 to 3 persons is hired in the summer months to maintain the buildings and yards. In recent years, a workforce of 15 to 25 persons have been working seasonally, dismantling the mill facility.

Though no metal mines are currently operating in the plan area, the potential for future mine development is good. Exploration work is ongoing, particularly in the Anyox - Kitsault and Ecstall areas. These exploration projects generate some employment in the plan area both through direct seasonal employment and indirect employment through services provided to the camps and persons in transit to exploration projects. From 1994 to 1999, over 6.5 million dollars was spent on mineral exploration in the plan area.

Construction aggregate

One privately owned rock quarry is located near Ridley Island, and the city of Prince Rupert operates a construction quarry near Seal Cove. Approximately 5 to 20 persons are seasonally employed at these operations. As there are minimal gravel resources proximal to the coast, the majority of aggregate products are trucked from operations in Terrace. The one private gravel pit in the plan area is located near Port Edward and employs 1 to 2 persons on a seasonal basis.

Oil and gas

Oil and gas potential is very high in Hecate Strait. However, development has not proceeded due to provincial and federal moratoria on ocean drilling and exploration in B.C. coastal waters (see Section 4.3.3: Mineral and Energy Resources). The local business community is actively lobbying to have the moratoria lifted in an attempt to bring additional employment to the area (PRDCC, 1999a). The Northern Development Commission is holding public meetings in 2001 to discuss the oil and gas issue.

2.2.3.8 High technology

Prince Rupert is taking steps to become a provider of high technology services. In 1998, Rupert became the first city in British Columbia to be completely wired with state-of-the-art fibre optic electronic infrastructure called Fibre and Asymmetric Digital Subscriber Line technology (ADSL). Currently high technology is a minor contributor to the local economy (0.05% of the after-tax income in 1996) but it is hoped that introduction of ADSL will entice new technologically-based businesses to the area. BC Ferries has plans to move part of its reservation system to Prince Rupert (Mrozewski, 1998).

2.2.3.9 Agriculture

Agriculture is a minor contributor to the local economy, employing 56 people in 1996 (Horne, 1999) (see Section: 4.8).

2.2.4 Community stability

A reliance on primary resource extraction makes the economy of the North Coast very sensitive to economic cycles. The economy of the area has been hard hit in recent years, with severe reductions in the fishing, forestry and related transportation industries. This downturn in employment is reflected in changes in the communities. Real estate values in Prince Rupert have dropped over the past two years and school rolls are declining as people leave the area to seek employment elsewhere (PRDCC, 1999b).

The Prince Rupert Economic Development Commission prepared an Economic Development Strategy for the city in 1998 to "act as a blueprint for Prince Rupert's economic success into the next millennium" (PREDC, 1998). The strategy, prepared through an extensive community consultation process, recognizes that the long-term health of the community will continue to rely heavily on fishing and forestry. It emphasizes the need to diversify industry within these existing sectors of the economy to provide greater economic stability. This includes value-added processing in fishing and forestry while considering other means of diversifying the economy e.g., through tourism, high technology, and encouraging local entrepreneurship. The strategy states that "the choice is simple: re-invent or die."

The Pacific Northwest Community Futures Development Corporation (PNW-CFDC) office opened in September 1999. The Corporation will offer business assistance (planning and funding) and training to help start new businesses in the area. CFDCs are non-profit organizations funded by the Western Economic Development Diversification Canada and Human Resources Canada. One of the initiatives being coordinated through PNW-CFDC is funding for four innovative businesses (an oyster farm, biotoxin monitoring system, fish canning, and seedling mats) under the Community Economic Adjustment Initiative.

A Community Fisheries Development Centre was opened in Prince Rupert in 1997 to coordinate transition programs for fishermen and to assist in renewing the fisheries resource. Centres are located throughout coastal BC and projects include habitat renewal, resource stewardship, value-added processing and improved resource utilization. The Prince Rupert office is providing programs through Fisheries Renewal BC in conjunction with local partners.

2.2.5 First Nations

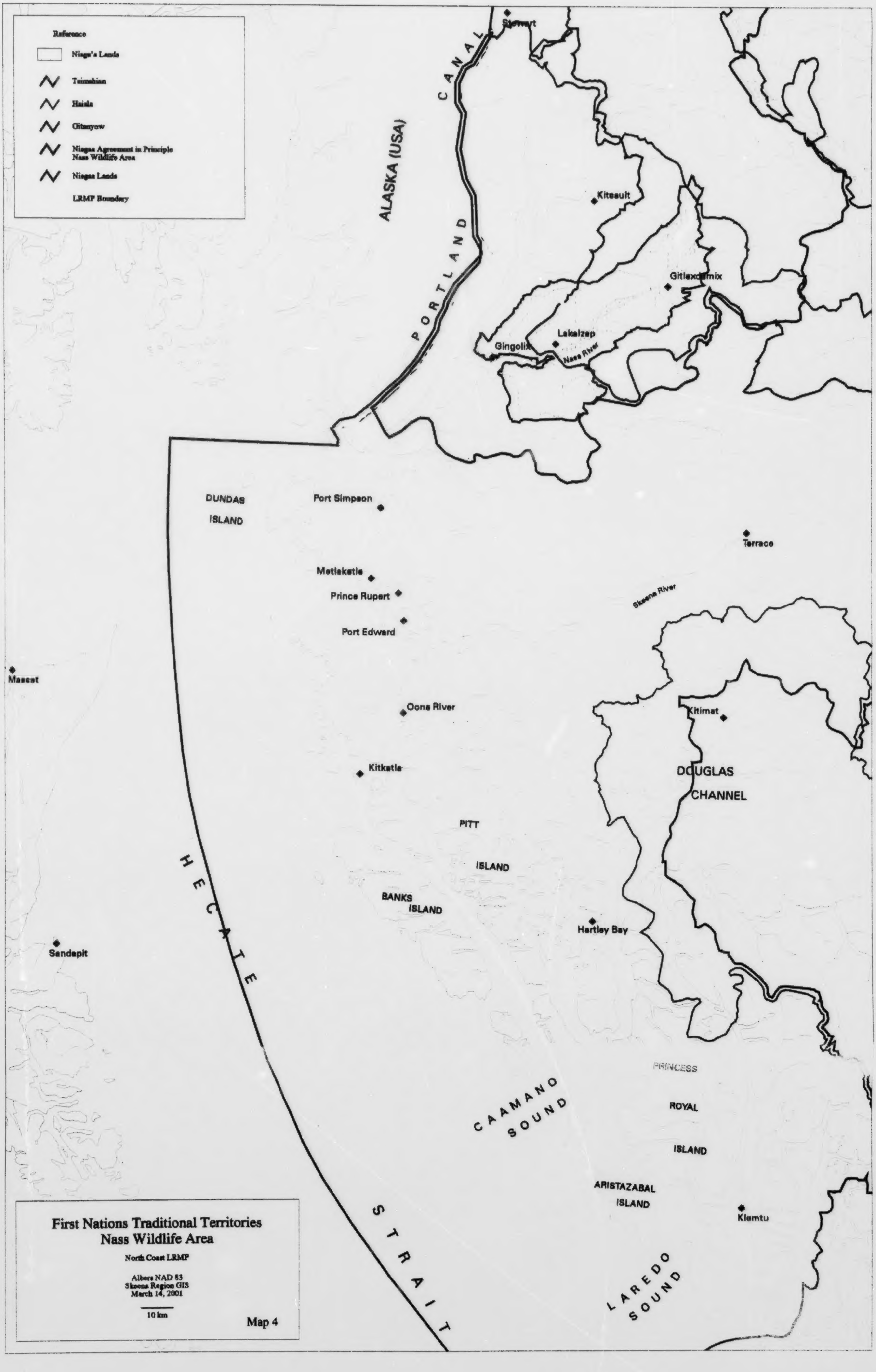
There are three First Nations - the Tsimshian, Nisga'a, Haisla Nations – with a significant interest in North Coast LRMP area. All have asserted ownership of traditional territories in the plan area (Map 4). The Tsimshian and Haisla Nations are currently involved in the treaty negotiation process. The Nisga'a Treaty received Royal Assent in the House of Commons on April 13, 2000.

All First Nations are concerned with the impact of current and future land use activities on the environment, including impacts on fish, wildlife and other resources. The food fishery from ocean and freshwater systems is a very important part of the cultural fabric of coastal First Nations. Trapping and hunting are also important traditional resource management activities as well as use of plants, trees and minerals.

2.2.5.1 Tsimshian Nation

The Tsimshian Nation has a population of approximately 10,000 people based in eight communities, seven of which are in British Columbia. These are Kitasoo/Xaixais, Gitga'at (Hartley Bay), Gitk̲xwaala (Kitkatla), Metlakatla, Lax Kw'alaams, Kitsumkalum and Kitselas. There is one other Tsimshian community on Annette Island in Alaska.

The Tsimshian communities in the North Coast LRMP area include Lax Kw'alaams, Metlakatla, Kitkatla, and Hartley Bay. The Kitasoo have a territorial interest although their present village is south of the plan area. The Tsimshian in the plan area are known as the Coastal and Southern Tsimshian. The ancestors of some of these communities traditionally lived on the Skeena River, moving to winter villages on the coast. Others were based on the coast and were sea-farers. When the Hudson's Bay Post was built at Port Simpson, a number of villages from the Skeena River moved closer to the fort.



First Nations Traditional Territories
Nass Wildlife Area

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

Map 4

The Tsimshian Bands and Tribal Council have been involved in a number of economic development projects over the years, including salmon enhancement, fish processing, roe-on-kelp operations, forestry operations on and off reserve, and tourism ventures. The Tsimshian Tribal Council (TTC) is the umbrella organization for the eight Tsimshian communities, with representation from each. The Tribal Council is actively involved in treaty negotiations and in local affairs. In 1997, the Tribal Council completed Stage 4 of the treaty negotiation process, signing a Framework Agreement with the Province and the Federal Government. In 1998, the Prince Rupert City Council established a committee composed of Council and Tsimshian representatives to encourage co-operation on issues concerning local First Nations and the city (Mrozewski, 1998).

Lax Kw'alaams

Commercial fishing and administration are the primary employers at Lax Kw'alaams. In 1994, 65% of residents owned their own fishing boats (NWCC, 1995). The Lax Kw'alaams Band operates a fish processing plant, providing seasonal employment for approximately 80 residents (Clouston, 1995e). The Band also operates a roe-on-kelp fishery, employing seven people during the herring season.

Members of the Lax Kw'alaams community are involved in a number of forestry operations, including harvesting, and silviculture activities such as planting, brushing, spacing and girdling (MOF, 1994b). The community was awarded a ten year non-replaceable forest licence in 2000. The community is also currently involved in a joint venture with Triumph Timber (formerly West Fraser) to log in the Chambers Creek drainage.

Metlakatla

Some of the people in Metlakatla work in commercial fishing, either on fish boats or at fish plants in Prince Rupert. The community runs a roe-on-kelp operation that employs up to eight people (Clouston, 1995b). Other enterprises include Metlakatla Ferries, Wolf-Island Sea Farms, and boat rentals (MOF, 1994b).

Tourism is being promoted by Metlakatla. The Metlakatla Development Corporation is involved in a tourism co-venture to conduct archaeological tours to cultural heritage sites on Pike Island (Laxspa'aws). A marina was completed in 1995.

Kitkatla (Gitk̲xwaala)

The main employers in Kitkatla are commercial fishing and administration. Many residents seek part-time employment in the summer at canneries in Prince Rupert. Other sources of work are in construction and through the Work Opportunity Programs administered by the Kitkatla Band Social Development Program. Kitkatla has a salmon enhancement contract and is also involved in boat-building projects.

Hartley Bay (Gitga'at)

As with other communities, most of the employment in Gitga'at is in administration and commercial fishing for salmon, halibut and herring. The Hartley Bay Band runs a salmon enhancement project and a roe-on-kelp fishery that employs about eight people on a seasonal basis. The community has a longhouse-style workshop for use by local carvers.

Kitselas and Kitsumkalum

The communities of the Kitselas and Kitsumkalum First Nations are outside of the plan area, but they have a reserve adjacent to Port Essington, the former cannery town at the mouth of the Ecstall River.

2.2.5.2 Nisga'a Nation

The Nisga'a comprise a Nation of 6000, 2500 of whom currently live in communities in the Nass River Valley (Nisga'a Tribal Council, 1995). In 1998, the Nisga'a Tribal Council reached a Final Agreement with B.C. and Canada on the Nisga'a Treaty. The Treaty, which received Royal Assent in 2000, recognizes Nisga'a ownership of approximately 22,000 km^2 of traditional lands in the Nass valley, including current reserve lands, some of which are outside of the Nass valley. The Nisga'a own the natural resources on their lands, including forest and mineral resources, and must manage them, at a minimum, to meet B.C. laws and standards.

The Nisga'a Lands are no longer subject to provincial strategic planning initiatives and have been excluded from the North Coast LRMP area. However, the Nass Wildlife Area (NWA) (Map 4), established as part of Treaty settlement, comprises a much larger landbase that includes lands within the LRMP area. The NWA is the area where the Nisga'a exercise their treaty right to hunt. The Nisga'a will participate in the conservation and management of the area, providing recommendations on hunting and wildlife management as part of a wildlife committee composed of representatives of the Nisga'a, British Columbia, and Canada.

The commercial and traditional food fishery is important to the Nisga'a, including the salmon and eulachon harvests along the Nass River. Trapping and harvesting of pine mushrooms are also important. All of the Nisga'a communities are actively involved in forestry, including logging and silviculture. The Nisga'a Economic Enterprise Corporation was established in 1992 to promote employment in forestry. Several Nisga'a are employed by Interfor's helicopter logging operations, working throughout coastal British Columbia ((MOF, 1994b)

2.2.5.3 Haisla Nation

The communities of the Haisla Nation are outside of the plan area, but a portion of their traditional territory lies within the LRMP area. Kitamaat Village is located southeast of the plan area along Douglas Channel.

Commercial fishing is the main economic activity to the community of Kitamaat. The eulachon food fishery harvest is very important to the Haisla, as it is to other coastal First Nations. The Haisla have expressed concerns about the impacts of forestry and other resource management activities on heritage sites and trapping areas as well as eulachon-producing rivers.

2.2.5.4 Other First Nations with an interest in the plan area

Two other First Nation groups, Gitanyow and Heiltsuk, have an interest in the proposed LRMP area, having asserted traditional territories within the plan area although their villages are currently outside of the plan boundaries.

2.2.6 Local government and community representation

The City of Prince Rupert is administered by a Mayor, six Councilors and a Chief Administrative Officer. The District of Port Edward council consists of a Mayor, four Councilors and a District Administrator.

With the exception of Oona River, outlying communities are on First Nations reserve lands and are administered by Band Councils that include a Chief Councilor, Councilors, and a Band Manager. Most Bands also have an Economic Development Officer.

Almost all of the plan area is within the Regional District of Skeena-Queen Charlotte, which includes the North Coast and the Queen Charlotte Islands/Haida Gwaii. There are five electoral areas in the Regional District. The North Coast is in Electoral Areas "A" and "C". The elected Board of Directors for the Regional District includes one representative from each electoral area. In addition, the City of Prince Rupert nominates two of their Council members to the Board, while Masset and Port Clements on the Queen Charlotte Islands/Haida Gwaii each nominate one representative.

3.0 RESOURCE DESCRIPTION AND VALUES

This section of the report provides an overview of the natural resources in the LRMP area, specifically vegetation, wildlife, freshwater fish, and coastal and marine resources. The use of these resources, for consumptive or non-consumptive purposes, is described in Section 4.0: Resource Uses.

3.1 Vegetation Ecology

3.1.1 Overview of ecosystems

The ecosystems of the North Coast are a reflection of the area's physical environment and climate. There are two distinct physiographic types: the outer mainland coast and islands, and the Coast Mountains. The ecosystems in these two phyiographic regions are distinct enough to merit separate consideration in planning and management of resources.

The outer mainland coast and adjacent islands comprise low-lying terrain, less than 650 m in elevation, with a complex shoreline. These coastal areas are predominantly classified within the Hecate Lowland ecosection (see S 2.1.1: Ecosystem Classification). The climate is hypermaritime; conditions are very wet, with fog and rain year-round. Slow growing cedar-hemlock forests and extensive peat bogs are characteristic features. The landscape pattern is patchy, with small to medium sized patches of forest within a matrix of non-forested peatlands and scrub of stunted shore pine, red cedar, yellow cedar and hemlock. Stream systems in these low elevation ecosystems are of lower gradient and shorter than in the more mountainous areas, with more limited off-channel fish habitat. Stream systems tend to be fed by precipitation and lakes (rather than glacier fed). Floodplain and estuarine development is limited.

Further inland are the Coast Mountains, with rugged mountains reaching up to 3000 m in height, deep channels, and heavily forested slopes, particularly at lower to middle elevations. These areas are predominantly within the Alaska Panhandle and Kitimat Ranges ecosections (see S 2.1.1: Ecosystem Classification). The climate is moderately drier than in the outer coast and islands. The forested portion of these ecosections is predominantly coastal temperate rainforest (see S 3.1.2: Forest Types). Forest cover occurs in large contiguous patches, interrupted infrequently by shrubby slide tracks (due to snow avalanches and debris slides), cliffs, rock walls, waterfalls, and wetlands. The mountainous terrain poses natural barriers to wildlife movement and connectivity of forest cover in along riparian corridors and over low elevation passes is an important habitat feature.

Wildlife species on the North Coast are adapted to the structural and functional features of these ecosystems (see S 3.2: Terrestrial Wildlife). Most organisms are forest dwellers or are associated with the forest. Some of the unique and sensitive ecosystems contributing to the diversity and productivity of the LRMP area include riparian corridors, floodplains, estuaries, tidal marshes, marine shoreline salt spray zones, limestone and karst geologies, freshwater wetlands (including sloped blanket bogs), talus slopes, and rock bluffs (S. Liepens, pers. comm.). Approximately half of the landbase in the North Coast is non-forested (alpine and low elevation muskeg).

3.1.2 Forest types

3.1.2.1 Coastal temperate rainforest

The forested portion of the North Coast area is predominantly coastal temperate rainforest. This forest type is characterized by old-growth conifer stands with a complex structure, often including very large, old trees. The complexity of the coastal temperate rainforest is due to its age and disturbance regime. Trees reaching 500 years of age are common in northern coastal rainforests. The wet coastal climate results in a low frequency of fire. For the most part, forests are replaced in piecemeal fashion by the death and replacement of individual trees, although large-scale disturbances such as windthrow and landslides also occur occasionally. This ongoing pattern of small-scale disturbance events results in patches and layers of vegetation at various stages of succession, with a range of tree sizes and ages. The patchy multi-layered canopy lets in enough light to encourage the growth of many moss and fern species and these forests are renowned for their dense understory.

The temperate rainforest extends from Oregon to Alaska, but there are different types of temperate forest characterized by geographic location and dominant vegetation. The temperate rainforest occurring in the North Coast area is called *perhumid*. Western hemlock and western redcedar are the most common tree species in the North Coast temperate rainforest. Amabilis fir is also common and frequently co-dominant in the Kitimat Ranges and Hecate Lowland ecosections, but absent in the Alaska Panhandle Mountains. Sitka spruce grows along rivers and shorelines, preferring cooler, wetter conditions. Spruce also occurs in montane and subalpine forests, particularly in the north of the plan area. Yellow-cedar and shore pine are frequent on the outer coast, typically growing on organic soils in peatlands. Yellow-cedar extends up to the subalpine. Red alder is widespread on disturbed sites. The distribution of black cottonwood is localized, the Skeena, Nass, and Quaal River floodplains being key examples.

The coastal temperate rainforest is equivalent to the Coastal Western Hemlock biogeoclimatic zone, and comprises 89% of the forested landbase in the plan area (Table 10, Map 2). The relative mix of vegetation in the CWH changes as one moves from the coastal areas (CWHvh2) to the more inland areas (CWHvm and CWHws). The CWHwm occurs at low elevations to the north of the plan area, for example, along the Portland Canal. The CWHvh2 is by far the most common variant, occurring in 55% of the forested landbase.

The coastal temperate rainforest is relatively rare worldwide. About half of the world's remaining unlogged coastal temperate rainforest is found on the west coast of North America from California to Alaska (MOF, 1998d). British Columbia contains large tracts of undeveloped temperate forest, particularly north of southern Vancouver Island and including the central and north coasts of the mainland. An analysis of satellite imagery in 1998 showed that 55% of the CWH biogeoclimatic zone in British Columbia, which corresponds with the coastal temperate rainforest, was in mature and old forest with minimal human impact. A further 32% consisted of younger forests, most of which had been logged and the rest disturbed by natural causes. 10% was naturally non-forested, consisting mainly of wetlands. 3% of the land area had been converted permanently to other uses. Over 9% of the coastal temperate rainforest in British Columbia is in protected areas (MOF, 1998d).

3.1.2.2 Subalpine forest

Subalpine forest occurs at higher elevations in the plan area. A characteristic feature of this forest is that the soils rarely freeze beneath the heavy and persistent snowpack, which influences the types of vegetation present. The snow-free season is short and the soils rarely dry out. Low-lying clouds are often present, providing a significant amount of additional moisture to the system. Mountain hemlock and amabilis fir are the most common species at these elevations, with yellow-cedar occurring in more maritime areas and minor subalpine fir in drier, colder areas. Sitka spruce and western redcedar are present, particularly along the outer coast, but uncommon. Western hemlock occurs throughout in the lower parts of the subalpine forest. Deciduous trees are rare. The lower elevations of the subalpine forest are continuously forested except where dissected by avalanche tracks, as is often the case. Upper elevations have clumps of trees interspersed with subalpine meadows and wetlands.

The subalpine forests are equivalent to the Mountain Hemlock biogeoclimatic zone, which occurs almost entirely on the western slopes of the Coastal Mountains. There are two subzones in the plan area: MHwh and MHmm. The MHwh occurs at subalpine elevations on the outer coast, while the MHmm occurs further inland.

Table 10 provides a breakdown of the forested landbase for the North Coast TSA by biogeoclimatic subzone or variant. Map 2 shows the biogeoclimatic variants in the plan area as well as the ecosections.

Table 10. Biogeoclimatic subzones and variants in the forested landbase.

Biogeoclimatic subzone/variant	% of the forested landbase
CWHwm	9.0%
CWHvh2	55.0%
CWHvm	18.1%
CWHvm1	3.4%
CWHvm2	1.5%
CWHws1	0.7%
CWHws2	1.3%
MHmm1	5.2%
MHmm2	1.2%
MHwh1	4.6%
TOTAL	**100%**

3.1.3 Rare ecosystems

The Conservation Data Centre (CDC) lists 16 plant species and 19 plant associations that are rare or endangered in the North Coast area (Appendix 1). These lists are not complete. All threatened plant associations listed by the CDC in the plan area occur in the Coastal Western Hemlock zone, with most occurring in the CWHvm and CWHvh subzones. These plant communities tend to occur at lower elevations, in valley bottoms, and along marine shores, which are also the areas having high value for forestry activities.

Other rare plant communities are found in limestone geologies, sloped blanket bogs, talus slope and rock bluffs. To date little research has been done in these areas. A number of research projects are currently underway in the Skeena region and Queen Charlotte Islands/Haida Gwaii to identify and manage rare plant associations and communities.

3.2 Terrestrial Wildlife

The types of terrestrial wildlife found in the North Coast LRMP area are governed by vegetation, climate and other ecological factors. The moist, mild climate and extremely productive forests at low to middle elevations result in a tremendously biodiverse coastal rainforest, providing habitat for a great diversity of birds, and variety other terrestrial animals. The Coastal Western Hemlock (CWH) zone, in particular the vh and wm subzones, has the greatest diversity of terrestrial vertebrate species in Prince Rupert Forest Region (MOF, 1994a.). The subalpine conditions in the Mountain Hemlock (MH) zone provide habitat for many of the vertebrates found in adjacent, lower-elevation subzones. However, the more dramatic temperatures and lower productivity the MH zone results in a reduction in species diversity. Some species may not get up into the higher elevations and those that do are likely present in lower densities and often for restricted seasons (MOF, 1994a).

A comprehensive inventory of species does not exist for the North Coast LRMP area. However, generalized habitats for select species inhabiting the Coastal Western Hemlock, Mountain Hemlock and Alpine Tundra zones are summarized in Meidinger and Pojar (1991).

3.2.1 Assessing habitat values

When managing for wildlife values, it is not only important to know what species live in an area and their population trends, but also what type of habitat they require and where this habitat lies in the landscape.

3.2.1.1 Habitat capability and suitability

Without sufficient habitat, a species' population will decrease and may ultimately disappear from an area. The relative importance of various ecological units (habitats) to wildlife populations can be estimated using habitat capability and suitability ratings. These ratings can also be used to provide information on how various management activities affect wildlife populations.

Habitat suitability ranks the *present* quality of habitat; habitat capability ranks the quality of *potential* habitat when vegetation is at its optimum seral stage for that particular species. An area may have a high capability, but due to its present vegetation structure, it will not have high suitability. The ratings are provincially based and thus reflect the potential of an area to support a particular species by comparing habitats of interest to the best available for that particular species in the province. Habitat effectiveness is also considered when rating habitats. Effectiveness is based on the human factors that displace animals. For example, an area may have high habitat suitability but due to the pressure of a mainline road, the habitat does not get used to its full potential, thus it has a lower effectiveness rating. Conversely, habitat effectiveness may increased other factors, such as the presence of spawning salmon.

Caveat: Habitat suitability and capability mapping is an initial attempt at identifying potential areas where certain wildlife species may occur. Because these maps are based on interpretations of vegetation patterns, they are not always accurate, particularly at a broad scale such as 1:250,000. Local knowledge is used to improve model reliability (Vanderstar, pers. comm.). This information often comes forward or is gathered as part of an LRMP process.

Broad Ecosystem Classification Mapping

Habitat capability and suitability is derived from ecosystem mapping. At the broad scale of an LRMP, Broad Ecosystem Classification may be the most appropriate scale for mapping wildlife habitat. Broad Ecosystem Classification or Broad Ecosystem Inventory (BEI) is an ecologically based classification system that provides an ecosystem perspective for resource management and land use planning. The unit of classification in this system is the Broad Ecosystem Unit (BEU). A BEU "is a permanent area of the landscape that supports a distinct type of dominant vegetation cover, or distinct non-vegetation cover (such as lakes or rock outcrops)" (RIC, 1998), and is generally named after the dominant climax vegetation within the unit. BEUs emphasize the site characteristics that determine the function and distribution of plant communities in the landscape. Each BEU is an amalgamation of biogeoclimatic ecosystem (BEC) units. Mapping of BEUs combines the ecoregion classification system (Demarchi, 1996) and the biological ecosystem classification (BEC) system (Meidinger and Pojar, 1991). A summary of these two classification systems is provided in Section 2.1.1. A more complete description is provided in RIC (1998).

Terrestrial / Predictive Ecosystem Mapping

A more detailed method of determining habitat suitability uses Terrestrial Ecosystem Mapping (TEM) as a foundation. This mapping occurs at a scale of 1:20,000 and is far more precise than mapping developed from broad ecosystem units. Detailed habitat suitability mapping and wildlife habitat interpretations have not been conducted for the North Coast LRMP area. Due to the expense of TEM, the Ministry of Forests has developed a method of predicting ecosystems called predictive ecosystem mapping. There are plans to complete predictive ecosystem mapping for the entire North Coast Forest District by March 31, 2002.

3.2.2 Wildlife species at risk in the North Coast area

This section briefly describes some of the wildlife species of highest management concern in the LRMP area and some of the government initiatives in place to help manage these species. These species include species at risk and those of regional significance. Habitat suitability and/or capability interpretations were not available at the time this report was written. However, wildlife interpretations will be prepared to inform the LRMP process.

Several species of animals and plants within the North Coast planning area are considered to be at risk to population declines, either because of conflicts with human activities or alterations to, or loss of, their habitats. Within British Columbia, species at risk are ranked by the Conservation Data Centre (CDC) as Red-listed[11] or Blue-listed[12]. Yellow-listed[13] species are regionally important. As of Nov 1, 1998, fourteen terrestrial animals (including terrestrial birds) found within the North Coast planning area are considered to be at risk to population declines, either because of conflicts with human activities or alterations to, or loss of, their habitats (Table 11). The marine mammals and seabirds listed by the CDC are included in Section 3.4: Coastal and Marine Biological Resources. Descriptions of habitat requirements for select species are included below.

Table 11. Terrestrial species at risk in the North Coast planning area.

Species	**Risk ranking (CDC)**	**Identified Wildlife Species**
Grizzly Bear (*Ursus arctos)**	Blue-listed	X
Fisher (*Martes pennanti)**	Blue-listed	X
Wolverine (*Gulo gulo luscus*)	Blue-listed	-
Keen's long-eared myotis (*Myotis keenii*)	Red-listed	X
Tailed Frog (*Ascaphus truei* – coastal pop.)	Blue-listed	X
Northern Goshawk (*Accipiter gentilis laingi*)	Red-listed	X
Peregrine Falcon (*Falco peregrinus pealei*)	Red-listed	-
Great Blue Heron (*Ardea herodias*)	Blue-listed	-
Short-eared owl (*Asio flammeus*)	Blue-listed	-
Trumpeter Swan (*Cygnus buccinator*)	Blue-listed	X

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[11] The Red list includes any indigenous species or subspecies (taxa) considered to be extirpated, endangered, or threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being, evaluated for these designations.

[12] The Blue list includes any indigenous species or subspecies considered to be vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not extirpated, endangered or threatened.

[13] The Yellow list includes any indigenous species or subspecies which is not at risk in British Columbia, but which is a regionally important species whose habitat requirements are not met by other provisions of the Forest Practices Code (e.g. *Biodiversity Guidebook* and *Riparian Management Area Guidebook*) or which is vulnerable during times of seasonal concentration (eg breeding colonies).

Species	Risk ranking (CDC)	Identified Wildlife Species
Gyrfalcon (*Falco rusticolus*)	Blue-listed	-
Sandhill Crane (*Grus canadensis*)	Blue-listed	X
Surf Scoter (*Melanitta perspicillata*)	Blue-listed	-
Pine grosbeak (*Pinicola enucleator carlottae*)	Blue-listed	-

* Species recommended by the BC government to be considered at the LRMP level under the Identified Wildlife Management Strategy.

Grizzly Bear

The grizzly bear (*Ursus arctos)* is one of the three Identified Wildlife species, along with fisher and bull trout that the BC government recommends is considered at the LRMP level. LRMPs have the responsibility of considering Grizzly Bear Management Areas (potentially as protected areas or resource management zones) under the BC Grizzly Bear Conservation Strategy, as well as setting operational direction for the management within grizzly bear habitat. The Identified Wildlife Management Strategy and B.C. Grizzly Bear Conservation are both described later in this section.

The grizzly bear is Blue-listed in BC. The historic distribution of the grizzly bear has shrunk considerably throughout North America. At one time, grizzlies were found throughout British Columbia, except for some coastal islands. Today grizzly bears have disappeared from much of the south and south-central parts of the province, and local populations are declining across much of the province. "Grizzly bear populations decline as human development encroaches into their range. [In effect] the more human activity, the fewer bears." (Schultze, pers. comm.). However, BC has some of the last large areas of remaining habitat and contains approximately quarter of the North American population (MELP, 1995).

Grizzly bears occur in relatively high densities along the coast of BC. The distribution of grizzlies in the plan area is restricted primarily to the mainland. Grizzly bears do not occur on many of the offshore islands, where black bear are the dominant species. The minimum estimated density for grizzly bears within the planning area is 35 animals per 1000 km^2 (Table 12). Populations are thought to be stable or declining slightly (Schultze, pers. comm.).

It is difficult to generalize about grizzly habitat requirements because these animals live in a diverse array of ecosystems. Some bears are considered seasonally "transient" and travel large distances, while "resident" bears have a much smaller range. Home ranges, which vary by sex and age, vary from 25km^2 for adult females to 350 km^2 for adult males in productive coastal habitats (MOF and MELP, 1997). Coastal grizzlies range over a variety of habitats, however, with the exception of denning areas and avalanche chutes, their prime habitat occurs predominantly below treeline and is largely concentrated in valley-bottom ecosystems associated with important salmon streams (Pojar et al, 1999. See also MacHutchon et al, 1993).

Because grizzlies employ a variety of strategies to meet habitat requirements, management of grizzly habitat must be considered at several spatial scales – from specific food-producing microsites to regional migration routes. Habitat over various time scales must also be considered. Food sources shift seasonally and annually, while habitat modification through development can affect habitat quality. Apart from food, habitat requirements include thermal cover (e.g. dens/bedding sites), security (e.g. cub protection), and access to potential mates (MOF and MELP, 1997).

The Khutzeymateen Park, established in 1994 in the north of the plan area, is Canada's only grizzly bear sanctuary. A provincial park, the area is jointly managed between British Columbia and Stewardship of the Gitsi'is Tribe, which is of the Tsimshian Nation. The highest priority for management in the sanctuary is the conservation of grizzly bears. Hunting for grizzly bears is not permitted and hunting for other species is not permitted below 1000m. The park provides 44,300 hectares of undeveloped habitat for the bears that use the area.

Table 12. Population estimates for grizzly bear and select species of significance in management units (MUs) which overlap the North Coast LRMP area.

Species	**Population Estimate*** (MUs 6-3, 6-10, 6-11 and 6-14) (1999)	**Comments**
Grizzly bear	864-1400	Minimum density = 35 / 1000 km^2
Deer	2105	Sitka blacktail (coastal species) and mule deer (interior species) are combined in this MELP population estimate.
Mt. Goat	4900	

* These estimates will be biased high because the MUs extend beyond the boundaries of the planning area.
Source: MELP

Fisher

The fisher *(Martes pennanti)* is one of the three Identified Wildlife species, along with grizzly bear and bull trout that the BC government recommends be considered at the LRMP level.

The fisher is Blue-listed due to populations that are believed to be declining over much of their range. Populations are susceptible to over-harvest by trapping and loss of habitat through forest harvesting (MOF and MELP, 1997).

Fisher habitat includes forested landscapes, especially those with mixed habitats and structural classes, edges and riparian areas. Forests with structural characteristics of older mature forests (e.g. age classes 6 and 7), particularly riparian areas with large trees (i.e. cottonwood floodplains), are key habitats for nesting and maternal denning. Important habitat features include canopy closure of > 30%, coarse woody debris (CWD), large wildlife trees, and canopy cover in winter. Foraging occurs in a wide range of structural stages including early stages (age classes 1 - 3), depending on presence of prey and cover. Primary prey species are associated with abundant CWD and a productive understory. Connectivity between riparian areas and between riparian and upland sites is important. Fishers require relatively large home ranges, averaging 15 km^2 and 40 km^2 for females and males, respectively. As a result, 600 km^2 has been suggested as a minimum area necessary to manage viable populations (MOF and MELP, 1997).

The presence or absence of fisher in the North Coast has not been determined. If fisher do occur in the plan area, the distribution will most likely be closely associated with the presence of large diameter black cottonwood, a critical element of denning habitat. Large diameter black cottonwood occur in relatively few locations, including, but not limited to the Skeena, Nass, and Quaal River floodplains.

Wolverine

The wolverine *(Gulo gulo luscus)* is Blue-listed. Intensive hunting of ungulates is a major factor in the decrease of wolverine populations across Canada. Trapping has also contributed to population declines in eastern Canada, while poisoning wolves has been detrimental to wolverines in western Canada because wolverines often take bait meant for wolves. Once populations become threatened, they may be slow to recover due to the low reproduction rates (less than one offspring per female per year) (CWS, 1999). Wolverines, like grizzly bears, are sensitive to loss of large wilderness areas. Anecdotal evidence suggests that wolverines are sensitive to human presence particularly near subalpine denning sites. They have been known to relocate kits several kilometres away after a human approaches, even on foot (Vanderstar, pers. comm.).

Wolverines are solitary animals that roam over large areas in search of food. They consume a wide variety of scavenged or fresh food items ranging from roots and berries, to small furbearers and fish, to large ungulates such as moose, caribou and mountain goats. Wolverine are often found in sub-alpine and alpine habitats in summer, and descend to lower elevations in the winter (CWS, 1999). In the North Coast Planning area, wolverines have been sighted at various elevations, including in valley bottoms.

Trumpeter Swan

The trumpeter swan *(Cygnus buccinator)* is Blue-listed and an Identified Wildlife species because breeding pairs are rare in BC and key wintering habitats are at risk to development and oil pollution. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated the Trumpeter Swan as not at risk in Canada (MOF and MELP, 1997).

Trumpeter swans are the largest birds in North America. They migrate annually from overwintering areas in Wyoming, Idaho and Montana and the coast of BC, to breeding areas in northwestern Canada and Alaska. Breeding occurs between late May and mid-September in secluded wetlands surrounded by forest. Breeding pairs return to nesting marshes each year, but will abandon nesting areas if disturbed too much. Known breeding sites are scattered throughout northern BC, with new nesting marshes discovered each year.

The Kitimat and Burns Lake areas form the southern extent of the swan's breeding grounds (MOF and MELP, 1997). The closest known breeding area to the North Coast plan area is along Kitimat Arm of Douglas Channel. Wintering areas are common in and among Skeena River back channels (Vanderstar, pers.comm.)

Peregrine Falcon

The peregrine falcon subspecies pealei *(Falco peregrinus pealei)* is Blue-listed in British Columbia. It is one of three sub-species of peregrine falcons in North America. Populations of peregrine falcon declined sharply in 1960s, evidently the result of poisoning from chemical pesticides or industrial pollutants (CWS, 1999). Extensive re-introduction programs have been initiated in Canada and the United States.

The peregrine falcon nests mostly on sheer cliffs. A breeding pair usually has several alternate nesting ledges within a breeding territory of several square kilometres. If the nest is disturbed or robbed, the adults will often re-nest in a different location, usually nearby. Peregrines feed almost exclusively on birds and nearly always strike them in flight. Because falcons specialize in direct aerial pursuit of prey they prefer non-forested areas in which to hunt, particularly shores, marshes, river valleys, open moors, or tundra (CWS, 1999).

The peregrine falcon is known to occur along the coast of the planning area. However, no breeding locations have been recorded (Campbell *et al.*, 1990). This may be due to a lack of research in this area.

Short-eared owl

The short-eared owl *(Asio flammeus)* is Blue-listed in BC. Natural succession, wetland drainage, urban expansion and increasingly intensive farming have contributed to its decline in Canada. The species is not protected by the federal Migratory Birds Convention Act (CWS, 1999).

The short-eared owl prefers large areas of relatively open habitat in marshland and tall grass fields. The owl searches extensively within its breeding ranges for prey. It likes to hunt and roost in abandoned pastures, fields, hay meadows and grain stubble during summer. Nests, built each year, are usually slight depressions in the ground hidden under low shrubs, reeds and grasses, and are often located near water (CWS, 1999).

There are no recorded breeding locations in the planning area.

Northern Goshawk

The Northern Goshawk, laingi subspecies (*Accipiter gentilis laingi*) is Red-listed in British Columbia. This subspecies is commonly referred to as the Queen Charlotte Goshawk. Although it is known to occur on the Queen Charlotte Islands/Haida Gwaii, coastal Alaska, and Vancouver Island, its distribution along the mainland coast has not been researched. At this time, goshawks in the North Coast area are being managed as an interior (Yellow-listed) species until their biology is better understood and a goshawk conservation strategy has been completed (Hetherington, pers comm.).[14]

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[14] Goshawk in the North Coast appear outwardly to be subspecies *laingi,* which are smaller and darker than the *atricapillis* subspecies found in more inland areas (Liepins, pers comm.).

The loss of suitable nest trees and forage habitat due to timber harvest is the key threat to this species. Natural and human predation, as well as declines in prey populations (e.g., the Stellar's Jay on the Queen Charlotte Islands/Haida Gwaii), adds to the stress on Northern Goshawk populations (CWS 1999).

Northern Goshawks rely heavily on mature to old forest with a closed canopy (CWS, 1999, MOF & MELP, 1997). They generally hunt for birds and small mammals within the old-growth forest canopy and understory. Breeding pairs tend to use the same nest site for at least two years; some pairs alternate between up to five nests within a territory (CWS, 1999). Foraging area for a breeding pair and its fledglings is roughly 2400 ha (MOF & MELP, 1997).

Keen's long-eared myotis

The Keen's long-eared myotis (*Myotis keenii*) is Red-listed. Limited information exists about this bat. Its distribution is limited, it is rarely seen, and little is known about its basic biology or its habitat requirements (MOF & MELP 1997).

This bat occurs along the coast of British Columbia and on the Queen Charlotte Islands/Haida Gwaii, although is distribution within the North Coast planning area is not well known (MEF & MELP, 1997). Knowledge of the bat's basic behaviour and habitats is mostly speculative since little research has been conducted on this species. The Keen's long-eared myotis has been observed in low elevation mature and old growth forests, but its forest structural stage requirements are unknown. It may have separate summer and winter ranges and probably hibernates over the winter. This species likely roosts in tree cavities, rock crevices, small caves, and under loose bark. Moths and other insects are thought to be food for the Keen's long-eared myotis (*Ibid.*)

Marbled Murrelet

The Marbled Murrelet is a small, secretive seabird that is Red-listed by the BC Conservation Data Centre. The largest threat to this bird is the loss of its habitat resulting from the harvest of old-growth forest (CWS, 1999). Other serious threats to Marbled Murrelets are entanglement in fishing nets and oil spills. It is considered to be the seabird most at risk from oil pollution (*Ibid.*). These birds are also highly sensitive to recreational boats. Boating in nearshore waters may force murrelets from their favoured feeding areas.

Marbled murrelets inhabit coastal waters in the north Pacific for most of the year, coming ashore in May to breed. They nest on mossy platforms or cavities on large branches in tall trees located mature and old-growth forests within 70 km from the ocean. While breeding, the birds feed at night on fish in nearshore waters. Within the North Coast planning area, marbled murrelets are known to occur in Gardner Canal and the Khutzeymateen valley (BC 1994. See also Schroeder et al, 1998). No dedicated surveys of marbled murrelets have been published from the planning area to date but research may reveal additional areas in which these birds are found.

A national recovery plan for these birds was approved in 1993 (see Section 3.2.4).

Tailed Frog

The tailed frog (*Ascaphus truei*) is Blue-listed. This species was only discovered as far north as the Skeena River drainage in the early 1990s (MOF 1996). The tailed frog is considered at risk because little is known about its abundance, distribution and habitat needs (Dupuis and Steventon, 1999). It is sensitive to increased temperatures, sediments and organic debris associated with logging without streamside buffers.

The tailed frog, whose name originates due to its tail-like reproductive appendage, inhabits small, steep permanent headwater streams, primarily along the coast. In central British Columbia, the tailed frog is found primarily in the CWH and MH zones. Within the CWH BEC zone, it is most common in the CWHws (Wet Sub-Maritime) subzone (See Map 2). Very few observations have been made in the CWHvh (Very Wet Hypermaritime) subzone.

Tailed frogs grow slowly and the time between laying eggs, through the tadpole stage, to frog stage is four years (MOF, 1996.). An additional 2 to 4 years is required for the frogs to reach maturity. The favoured habitat of this species is relatively stable streams with cool, clean water and low quantities of fine sediments. Forested habitat adjacent to natal streams is important for adult tailed frogs (Liepins, pers comm.).

Tailed frogs are sensitive to degraded stream habitats (and thus vulnerable to local extirpation) because of their long developmental stage and high degree of specialization (Dupuis and Steventon, 1999). Current riparian guidelines for logging around waterbodies focus on fish presence and are not relevant to many streams containing tailed frogs, which are often found in steep streams that are not fish bearing.

Bull Trout

Bull trout is considered at risk in the North Coast Forest District by the BC Conservation Data Centre. Bull trout, is however, an interior species and may not be found in the watersheds of the North Coast. A description of bull trout and habitat is provided in Section 3.3: Freshwater Fish.

3.2.3 Other species of interest

Other species of interest include, but are not limited to, Kermode bears, mountain goats, moose, coastal black-tailed deer and bald eagles. Following are brief descriptions for Kemode bears, mountain goats, coastal black-tailed deer, and moose.

Kermode Bear

The Kermode bear (*Ursus americanus kermodei*) is a sub-specie of black bear. Kermode bears may have black or white coats. While black-coated Kermode are indistinguishable from other black bears, the white-coated phenotype has achieved international recognition as the "Spirit Bear." The genetic basis for the white coat has not yet been well explained (Marshall and Ritland, 1998) and scientists are uncertain as to whether or not the Kermode are an actual subspecies (Davis 1998).

Black bears, including Kermode bears, are generalists and are found in a wide range of habitats including young, deciduous forests (aspen and cottonwood), old growth forests, avalanche tracks, riparian areas, estuaries and up into sub-alpine and alpine meadows (Meidinger and Pojar, 1991). They also eat an extensive array of food including insects, small mammals, fish, berries, grass and fruit. Large, hollow trees are critical for denning (Vanderstar, pers comm.).

The Kermode bear is rare in British Columbia and most occur in the north central coast. Although its distribution is not well defined, within the LRMP area Kermode bears are most commonly seen on Gribbell and Hawkesbury Islands and on Princess Royal and Roderick Islands immediately south of the LRMP area. They have also been observed inland as far as Kitwanga (Vanderstar, pers comm.) and in the Nass River Region (Davis, 1998). Kermodes are also found in northeastern BC in the vicinity of the Alaska Highway (Hamilton, pers comm.).

Mountain Goat

The mountain goat *(Oreamnos americanus)* is recognized as a regionally significant species under the Identified Wildlife Management Strategy. Mountain goats are found in rugged mountainous areas. Summer and winter habitats vary primarily by elevation. Between June and September, mountain goats are found in alpine and subalpine meadows and cliff faces feeding on grasses, sedges, rushes and forbs. In winter, predator avoidance and a wet, sticky and deep coastal snow pack confines mountain goats primarily to old-growth forest stands in close proximity to escape terrain. Such habitat commonly extends to, and includes, valley bottoms (Vanderstar, pers. comm.). Features of winter range include south- and west-facing slopes generally within 400 meters from steep escape terrain, (MOF & MELP, 1997). Mature forests (age classes 6 and 7) and old forest with suitable attributes provide thermal cover and forage in the winter. Shrubs, lichens, and fir trees supplement the winter diet.

Because goat winter range is limited in size, even small areas of habitat alteration within winter habitat can have a disproportionally larger affect on the associated goat population. The maintenance of goat travel routes between patches of escape terrain in winter ranges is important to ensure habitat effectiveness. Removal of old growth forest in winter habitat areas lowers the quality of goat wintering sites by decreasing the amount of available forage and reducing the ability of the forest canopy to intercept snow.

Coastal Black-tailed Deer

In British Columbia, black-tailed deer occur west of the Coast Range elevational divide throughout the mainland coast and on most coastal islands. With the exception of the Dundas Islands, Sitka black-tailed deer (*Odocoileus hemionus sitkensis*) are found throughout the North Coast plan area.

Deer populations are influenced by available forage, quality of winter range, and the balance between deer and its predators such as wolves. Generally, black-tailed deer use a broad range of habitat types, with the exception of the non-vegetated areas of the alpine zone (glaciers, snowfields, bedrock). In winter, the deer are primarily found at lower elevations (< 400 m) in mature and old growth forest with stand attributes that provide winter forage as well as security and thermal cover and the interception of snow and rain. The most concentrated winter use areas appear to be centred along topographic features such as ridgelines and benches on steeper slopes with the provision that adjacent habitats meet forage and cover needs (Liepins, per comm.). This preferred use of steeper terrain is suggestive of behavioural adaptations related to predator (wolf) avoidance. Evergreen forbs and lichens have been shown to provide a significant part of the winter diet (Blood et al, 2000).

While young clearcuts can provide an ample food supply, winter use is limited to those areas adjacent to suitable thermal and security cover and to periods when snow conditions do not preclude deer movement through open areas (Liepins, pers comm.). Silvicultural techniques to create gaps and promote understory development can be utilized to enhance second growth habitats as winter range.

Moose

Moose are a relatively recent addition to the fauna of the North Coast, migrating into the area in the early 1900s as the area was opened up with logging and roads.

Suitable moose winter range is largely confined to the spruce-cottonwood riparian habitats of major rivers (Skeena and Nass) and tributary confluences. Along major rivers, the annual flooding and deposition of sediment results in self-perpetuating shrub communities in early seral stage, or as understory in cottonwood or mixed-wood forest stands. These areas are considered to be the primary winter range for moose.

Upland site disturbance, such as timber harvesting, will also produce seral shrub communities that moose will forage in during the winter months if snow depths and proximity to cover are favourable. These temporary early seral shrub communities, providing an abundance of willow and/or red-osier dogwood, are considered secondary moose winter range.

Stands or patches of old growth conifers with snow intercepting canopies are preferred for winter bedding sites and also for thermal and security protection during extremes of mid-winter and when March temperatures may result in potential over-heating of moose with winter coats. In addition, visual screening from roads and, where necessary, control of public access can reduce vulnerability of moose to poaching and human-induced habitat displacement.

3.2.4 Current wildlife management strategies relevant to LRMPs

a) Identified Wildlife Management Strategy

The Identified Wildlife Management Strategy (IWMS) is one of the components of the Forest Practices Code meant to meet the goals of conserving biological diversity. The Forest Practices Code assumes that the habitat requirements for the majority of species and plant communities will be addressed through "coarse filter management" as per the *Biodiversity Guidebook* (MOF and MELP, 1995a) and the *Riparian Management Area Guidebook* (MOF and MELP, 1995b). The Identified Wildlife Management Strategy focuses on "fine filter management" i.e., managing for habitat requirements of select wildlife species (and plant communities) that require additional management attention. Identified Wildlife are selected from provincial lists of species at risk. Two documents comprise the Identified Wildlife Management Strategy:

1) *Species and Plant Community Accounts for Identified Wildlife* (MOF and MELP, 1997)

   Summarizes the status, ecology, distribution and habitat requirements for each identified species or plant community;

2) *Managing Identified Wildlife: Procedures and Measures* (MOF and MELP, 1999)

   Describes specific management prescriptions for identified species or plant communities.

Most Identified Wildlife species are to be managed within established Wildlife Habitat Areas (WHAs) at the operational stage of forest planning. However, three species in the IWMS, grizzly bear, fisher, and bull trout, are "higher level plan species" and are to be addressed through strategic land use plans such as LRMPs. For these species, habitat requirements need to be addressed over large areas due to large home ranges, low densities, widely distributed limiting habitats, or sensitivities to forest level disturbances (MOF and MELP, 1999). LRMPs can provide direction to manage these "higher level plan species" through recommendations for zoning as well as objectives and strategies to guide resource development activities. This includes direction to conserve critical habitat features and minimize effects of development activities on disturbance or displacement.

The management of other species of wildlife can also be addressed at the LRMP level. Higher level plans (as recommended through an LRMP) are the key vehicle for formally designating ungulate winter range (mountain goat, moose and black-tailed deer) under the Forest Practices Code.

b) British Columbia Grizzly Bear Conservation Strategy

"The mandate of the [BC Grizzly Bear Conservation] strategy is to ensure the continued existence of grizzly bears and their habitats for future generations." The strategy has four goals:

- ☐ To maintain in perpetuity the diversity and abundance of grizzly bears and the ecosystems on which they depend throughout British Columbia.
- ☐ To improve the management of grizzly bears and their interactions with humans.
- ☐ To increase public knowledge and involvement in grizzly bear management.
- ☐ To increase international co-operation in management and research of grizzly bears." (MELP, 1995).

"The goals and objectives of this strategy address three major issues:

- ☐ loss and alienation of grizzly bear habitat
- ☐ interactions with humans, and
- ☐ international considerations."(MELP, 1995).

One of the main components of the Conservation Strategy is the identification of Grizzly Bear Management Areas (GBMAs) where hunting of grizzly bears is prohibited. Benchmark GBMAs are intended to act as permanent examples of naturally regulated populations and are identified through LRMPs and the Protected Areas Strategy. The Kalum LRMP has recommended the establishment of the Skeena-Nass Grizzly Bear Management Area as part of its consensus recommendation in February 2001.[15] The proposed Skeena-Nass GBMA has some overlap with the North Coast plan area. The North Coast portion of the proposed GBMA includes Khutzeymateen Park grizzly bear sanctuary and an adjacent "hunting-closed" zone where hunting of grizzly bears has been closed for several years.

On February 8, 2001, the Office of the Premier and the Ministry of Environment, Lands and Parks announced a three-year Moratorium on Grizzly Hunting in British Columbia while scientists assess B.C.'s grizzly bear population and provide expert conservation advise to the government. The moratorium is temporary and should not affect the process of identifying and establishing GBMAs.

In addition to GBMAs, the Grizzly Bear Conservation Strategy also includes strategies for research, inventory, education, changes to hunting regulations, and increased enforcement and penalties (MELP, 1995). Habitat conservation measures are to be addressed through strategic level planning (as described in the Identified Wildlife Management Strategy). The Grizzly Bear Conservation Strategy will act in combination with zoning and objectives to maintain grizzly bear habitat, as identified through strategic land use plans, in an overall strategy to maintain grizzly bear populations within the province.

c) Marbled Murrelet National Recovery Plan

The national recovery plan is a federal initiative under the RENEW program (Recovery of Nationally Endangered Wildlife) of Environment Canada. A plan was initially established in 1993. The purpose of the plan is to improve the status of the marbled murrelet in Canada to vulnerable from threatened (CWS, 1999). Currently, a joint provincial – federal team is updating the plan and working on management objectives (Steventon, pers. comm.). The long-term objective is "to ensure effective and timely actions to protect marbled murrelets by reducing threats to their nesting habitat and reducing risks faced by birds at sea" (CWS, 1999).

3.3 Freshwater Fish

The freshwater resources in the North Coast LRMP area are characterized by small and mid-sized rivers and lakes. In addition, the lower reaches of the Skeena River pass through the area and discharge to the ocean. The Nass River also discharges into the planning area, although the river itself is within Nisga'a Lands. Many of the rivers and streams contain a wide variety of economically and culturally important freshwater and anadromous fish (Table 13). Salmon spawn in many of the coastal streams or move through the Skeena River to spawn upstream.

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[15] The Kalum LRMP also recommended two small GBMAs: one across the Skeena River and the other across the Kitimat River

Table 13. Economically or culturally important fish species found within the North Coast LRMP area.

Species	**Skeena River**	**Coastal Streams***
Chinook Salmon (*Oncorhynchus tshawytscha)*	x	x
Coho Salmon (*Oncorhynchus kisutch)*	x	x
Pink Salmon (*Oncorhynchus gorbuscha)*	x	x
Sockeye Salmon (*Oncorhynchus nerka)*	x	x
Chum Salmon (*Oncorhynchus keta*)	x	x
Steelhead (*Oncorhynchus mykiss)*	x	x
Rainbow Trout (*Oncorhynchus mykiss)*	x	x
Cutthroat Trout (*Oncorhynchus clarki)*	x	x
Dolly Varden (*Salvelinus malma)*	x	x
Bull Trout (*Salvelinus confluentus)*	?	-
Eulachon (*Thaleichthys pacificus*)	x	x
Burbot (*Lota lota)*	x	-
Green Sturgeon (Acipenser medirostris)	x	-
White Sturgeon (*Acipenser transmontanus*)	x	-
Mountain Whitefish (*Prosopium williamsoni)*	x	-

* Species vary among creeks.

Source: MELP, 2000

Bull trout *(Salvelinus confluentus* - a char species*)*, although identified by the Conservation Data Centre as a fish species at risk within the North Coast Forest District, are not known to occur within the planning area. To date, no records for bull trout exist in the Fisheries Inventory Summary System database. Although they are generally an interior species, their presence in the streams tributary to the lower Skeena River should not be ruled out until fish inventory work is complete.

The bull trout is Blue-listed in BC because populations are declining globally. Bull trout are sensitive to habitat degradation, are vulnerable to sport fishing pressure, and are considered an indicator species of ecosystem health. They appear to have a narrower range of habitat preferences than other salmonids and require clean, cold (<15°C), well-oxygenated water. They can be found in large rivers, lakes and small headwater streams with gradients up to 30% (generally <20%). Bull trout require large, deep pools for overwintering. Spawning occurs in streams in the fall. Bull trout can be finicky when selecting a spawning site. Groundwater seepage into the spawning beds may be a critical requirement. Groundwater seepage channels and high gradient headwater streams are also often used for rearing. Because spawning habitat is often geographically separate from overwintering and foraging habitat, migratory corridors linking seasonal habitats are critical (MOF and MELP, 1997).

Population data for most species of fish in the planning area is sparse. However, the Department of Fisheries and Oceans (DFO) collects fish escapement data for the major rivers. The escapement for a given species is the number of salmon escaping predators (including fishing) to reach the mouth of the stream or river in which they spawn. The following sub-sections summarize escapement data and stock status for salmon species in the major watersheds containing salmon.

3.3.1 Skeena River watershed

The Skeena River supports runs of all five species of salmon. Fish moving up the Skeena disperse throughout the watershed, generally spawning upstream of the planning area. Juvenile salmon, once old enough, move downstream into the planning area to the vital habitat found in the Skeena estuary.

The largest salmon runs in the Skeena watershed are pink salmon. Between 1994 and 1999, escapements varied from 0.5 to 3 million fish, with odd years having larger numbers of fish. Stocks have returned to average levels after reaching very high levels in the late 1980s and early 1990s (Wagner, pers. comm.). Non-Babine sockeye escapements range from 30,000 to 100,000 and are stable. The Babine sockeye is the largest sockeye run in the system with between 0.5 and 1.5 million fish. In the past five years, chinook escapements have ranged from 40,000 to 50,000 fish. Numbers have improved since the early 1980s due to the Canada/U.S. Salmon Treaty (*Ibid.*). Some coho stocks in the Skeena watershed were at dangerously low levels in the mid-1990s. However, strong coho returns to the Skeena system in 1998 and 1999 as a result of fishing restrictions (Wiens, 2000) and higher survival rates, combined with continued restrictions in 2000 may help rebuild stocks. Chum numbers in the Skeena River have always been small. In recent years, escapements have been roughly 10,000 to 20,000 fish.

Steelhead stocks experienced historic lows in the early 1990s. In recent years the stocks have recuperated, showing near record returns in 1998 and 1999. Monitoring of Skeena steelhead stocks has taken place from 1956 (Atagi pers. comm.). Issues still facing stock viability include commercial interception (much improved) and the First Nations harvest based on their need for food, social and ceremonial purposes (*Ibid.*).

3.3.2 Nass River watershed

The Nass River flows through Nisga'a Lands and is excluded from the LRMP area.

3.3.3 Coastal streams / rivers

Several coastal streams have moderate to large salmon runs (Table 14). Pink runs dominate in these streams.

Table 14. Average salmon escapements (1950-1997)* for select coastal creeks and rivers within the North Coast planning area.

River	Sockeye	Chinook	Coho	Pink (even)	Pink (odd)	Chum
Ecstall River[#]	405	1,822	3,274	6,706	14,078	9,730
Khyex River		140	1,281**	6,679	34,121	717
La Hou Creek			897	14,638	9,871	
Moore Cove Creek			1,677	43,625	33,071	500
Oona River[#]			629	14,048	5,988	

Counts were not conducted in all years between 1950 and 1997. In some cases, only 5 years of data exist. Raw data was not readily available, so summaries of averages by decade were not possible for this report.

# Ecstall and Oona rivers are the only systems regularly checked for coho.

** This number is an under-estimate, because most coho spawn in the tributaries and are not counted.

Source: Morrell (1998) – **data is preliminary.**

In a recent preliminary study on the stock status of Skeena River salmon, a number of streams tributary to the lower Skeena and nearby area were determined to have salmon stocks at a moderate (M) to high (H) risk of extinction (Morrell, 1998). These included:

- Ecstall River Chinook (M)
    - ⇒ Hayward Creek* Pink – even years (M)
    - ⇒ Johnston Creek* Chinook (H), Pink –odd years (M), Chum (M)
    - ⇒ Lockerby Creek* Pink – even years (H)
    - ⇒ Madeline Creek* Pink – odd years(H)
- Khyex River Coho (H)**, Chum (M)
- Kloiya River Coho (M)[†], Chum (H), Chinook (M)
- Little Useless Cr. Pink – odd years (M)[✧]
- Silver Creek Coho (M), Chum (H)[°]

These conclusions are preliminary and should be used with caution. Ratings are clarified below.

* Hayward, Johnston, Lockerby and Madeline creeks are tributaries to the Ecstall River. The pinks and chums that spawn in these creeks tend to wander a lot and are all part of the Ecstall River stock (i.e. they are not unique stocks) are not unique stocks (Wagner, pers. comm.). DFO is no longer determining pink and chum escapements for the tributaries of the Ecstall River (*ibid.*) However, DFO plans to resume counting chinook on Johnson River this year after an interruption of several years.

** Morrell (1998) indicated that coho stocks in the Khyex River are at a high risk to extinction. DFO believes that this rating is the result of poor stock assessments in the river (Wagner, pers. comm.).

† The Kloiya River rating for coho needs to be verified with DFO (Wagner, pers. comm.).

✧ Silver Creek is not inspected for adult coho and only on occasion for pink and chum salmon. Chum stocks have likely been low for 30 years (Wagner, pers. comm.).

° Little Useless creek is difficult to assess and the rating for pinks salmon may not be applicable (Wagner, pers. comm.).

3.4 Coastal and Marine Biological Resources

This summary represents a brief overview on marine biological resources in the North Coast LRMP area. A more thorough discussion of marine species and habitats together with potential impacts of land use can be found in the *Central Coast Land and Coastal Resource Management Plan Socio-Economic & Environmental / Marine Base Case Report* (Ministry of Employment and Investment *et. al.*, 1999). Habitat and species descriptions are found within chapters of that report. Much of the Base Case Report can be extrapolated to the North Coast planning area and has been borrowed from heavily in the following section.

3.4.1 Introduction

A wide variety of marine animals and plants inhabit the nutrient-rich coastal waters of British Columbia. Some plants and animals live on the sea floor (benthic), while others swim or float within the water column. In these broad habitats, some animals are fastened to the sea floor and require currents or waves to deliver food, while others actively seek food. The biological communities found in various habitats are determined by the interaction of physical, chemical and biological conditions including wave action, currents, bottom slope and substrate along with salinity, temperature, light levels, dissolved oxygen, suspended sediments, nutrient availability and exposure to air (Booth, 1999).

Production and biomass tend to decline with water depth, and/or distance from shore (Wahl *et al.*, 1993). Hence, nearshore habitats (intertidal and subtidal) are often of key ecological significance. They are the interface of the terrestrial and marine environments and, as such, are important to many aquatic and land-based creatures. These areas, particularly kelp beds and estuaries are highly productive and biologically diverse. Key nearshore habitats selected for description in the Base Case report for the Central Coast Land and Coastal Resource Management Plan (CCLCRMP) include salt marshes, sea grass beds and tidal flats, canopy kelp beds, subtidal rocky reefs and localized areas of upwelling (Booth, 1999). Key marine fish, bird and mammal species identified for the CCLCRMP are listed in Table 15.

Most research associated with coastal biological resources is applied to species of economic importance to the fishery. Often stock status and species distribution is biased toward areas where fishing occurs (Booth, 1999). As a result, the actual distribution of habitats and species may be more widespread than is currently known.

Table 15. Marine animals in British Columbia with particular value as identified in the Central Coast LRMP.

Animal Group	**Important habitat features**	
Marine fish & invertebrates	Spawning grounds, juvenile rearing areas, areas of concentration	Pelagic[16] fish: salmon, herring, pilchard, smelt, eulachon
		Groundfish: rockfish, halibut and other flatfish, walleye pollock, cod, hake, lingcod, sablefish
		Invertebrates: urchins, sea cucumber, crab, prawn, shrimp, clams, geoduck, abalone, octopus, squid
Marine and Coastal Birds Nesting sites, colonies, areas of concentration	Nesting sites, colonies, areas of concentration	Marbled Murrelet
		Colonial alcids: Cassin's Auklet, Rhinoceros Auklet, Pigeon Guillemot
		Storm Petrels (Leach's, Fork-tailed)
		Offshore Procellariformes : shearwaters, fulmars, albatross
		Nesting gulls: Glaucous-winged Gull
		Offshore gulls
		Nesting shorebirds: Black Oystercatcher
		Migratory shorebirds
		Cormorants: Pelagic, Brandt's, Double-crested
		Waterfowl: Geese, swans, dabbling and diving ducks, loons, grebes
Marine Mammals	Haulouts, breeding sites, areas of concentration	Harbour seals
		Northern sea lions
		Killer whales
		Grey whales
		Humpback whales
		Pacific white-sided dolphins
		Dall's porpoises
		Harbour porpoises
		Other whales: blue, minke, fin, sei, sperm, northern right

Source: Table 1 (Booth, 1999.)

3.4.2 Anadromous fish

Salmon

Salmon are anadromous, meaning they live most of their lives in the ocean, but return to freshwater to spawn. The chief factors affecting salmon production are freshwater and marine survival rates. These rates are affected by numerous conditions including water quality, food supply, natural predation and harvest. Eggs and juveniles depend on cold, clean water and sufficient habitat. Juvenile survival rates in freshwater systems can be affected by the alteration of streams and streamside vegetation by forestry, agriculture, urban development, mining, and linear developments such as roads and powerlines. Oceanographic conditions including temperatures, salinity and food supply help determine the number of adults available for harvest by the commercial, recreational and First Nations fisheries.

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[16] Pelagic: Open ocean.

Fish escapement data is used to determine the numbers of spawners returning to streams. This data is not always accurate, but it can be used for estimation purposes. The escapement for a given species is the number of salmon escaping predators (including human fishers) to reach the mouth of the stream in which they spawn.

Eulachon

The eulachon (*Thaleichthys pacificus*) is an anadromous member of the smelt family. It tends to live in shallow coastal habitats and spawns near the ocean on the shores of medium and large rivers. Eulachon appear to be opportunistic spawners (perhaps influenced by environmental factors) and will not always spawn in the same river from year to year. The eulachon harvest is an integral part of the coastal First Nations life.

3.4.3 Marine fish

Over 300 species of fish are found off the west coast of British Columbia (Hart, 1973). Most research has been conducted on the relatively few species of economic significance (i.e. associated with a fishery). Most fishing pressure is applied to the groups of fish listed in Table 16. We will provide a brief description of each of the groups of fish caught in various fisheries. More detailed species accounts are found in Booth (1999).

Fish

Pelagic fish live in the water column of the open ocean (as opposed to the ocean floor). The key groups of pelagic fish in the North Coast LRMP area include herring, pilchard and smelt. The Pacific Herring (*Clupea pallasi*) is a silver fish up to 46 cm long. These fish often swim in huge schools in open shallow areas or in mid-water in deeper areas (Lamb and Edgell, 1986). Herring, both fish and eggs, are a vital part of the marine food web, as many marine birds and mammals, as well as other fish, eat herring and herring spawn. Spawning and rearing areas have been mapped for the entire BC Coast (Hay *et al.*, 1989) in order to identify and protect these sites. Aquaculture, log storage and development related to oil and gas exploration and extraction could potentially affect Pacific herring spawning grounds (*Ibid.*). These areas are ranked low to high relative to other areas of the province, based on a spawn index. Populations are thought to be healthy (Booth, 1999).

Pilchard, or the Pacific sardine (*Sardinops sagax*), is a small silver fish about 30 cm in length (Hart, 1973). At one time supporting a large fishery, the Pilchard is now relatively rare in BC, likely the result of a combination of overfishing and cold water temperatures in the 1940s. Populations are recovering, but are still far below historic levels. Spawning occurs of the west coast of the United States and Mexico. Seasonal migrations bring the fish into British Columbia (Booth, 1999).

Seven species of smelt live in the coastal waters of BC (Lamb and Edgell, 1986). Examples include the surf smelt (*Hypomesus pretiosus pretiosus*), longfin smelt (*Spirinchus thaleichthys*) and capelin (*Mallotus villosus*). Surf smelt and capelin spawn on sand or gravel beaches in the summer and fall, respectively (Lamb and Edgell, 1986). Populations of smelt in the plan area are not monitored and are unknown.

Groundfish

A vast array of groundfish is found within the plan area. Table 16 lists the stock status of those groundfish considered commercial most important. Distributions are relatively well known based on logbooks from fishers (Booth, 1999).

Table 16. Condition of groundfish stocks in British Columbia for the 1999/2000 fishing season.

Species or species group	**Stock condition (1999/2000)**
Walleye Pollock	Low to average*
Pacific cod	Very low
Sablefish	Average
Offshore pacific hake	Average
Halibut	Declining
Petrale sole	Very low
Rock sole	Average to high*
English (Lemon) sole	Average to high*
Dover sole	Average to high*
Slope rockfish (Pacific ocean perch, redstripe, yellowmouth, rougheye, shortraker, and shortspine and longspine thornyheads)	Low to average*
Shelf rockfish (silvergrey, widow, yellowtail and canary rockfish)	Low to average*
Inshore rockfish	Low to average*
Offshore lingcod	Average to low
Spiny dogfish	Average

Source: Booth (1999) for all but halibut. Halibut (Leaman, pers. comm.).

Codfishes

Pacific Cod (*Gadus macrocephalus*), Walleye Pollock (Theragra chalcogramma), and Pacific Hake (*Merluccius productus*) are the three species in the cod family of most importance in the fishery. The codfishes, although most often close to the bottom, form huge schools and swim throughout the water column (Lamb and Edgell, 1986). The Pacific Cod, is a short-lived, fairly fast reproducing species. It generally lives near sandy or muddy bottoms in relatively shallow depths in the summer, migrating to deeper water (100-130 m) in the winter (Forrester IN Booth, 1999). The cod's population fluctuates from year to year. The Walleye Pollock is the most abundant fish in the North Pacific Ocean (Bakkala *et al.*, 1986 IN Booth, 1999), and is the basis of the largest fishery in the world. This fish is also a popular food of fur seals (Hart, 1973). It is often found near sandy or muddy bottoms (Lamb and Edgell, 1986), and can be found to 370 m (Hart, 1973). Current stock status is unknown (Booth, 1999). Pacific Hake is not a common species in the planning area although fishers based in the plan area likely fish this species further south. It tends to be found in southern BC over the continental shelf at depths of 200-1000m (Booth, 1999). It feeds at night and may come much closer to the surface while feeding (Lamb and Edgell 1986). Hake generally spawn in waters south of Washington State (usually California and Mexico). Starting at the age of 3 years, they migrate annually into BC. Stocks have been declining since the mid-1980s, but are thought to be moderate condition (Booth, 1999).

Flatfish

Flatfish is a group of flat, bottom dwelling fish with both eyes on the same side of their head. This group, also called flounders, consists of sole, flounder, sanddab and halibut. Most species live on sand or mud bottoms from depths less than 50 m to depths of 750 m. (Booth, 1999; Lamb and Edgell, 1986). Most halibut from BC migrate to Alaskan waters to spawn. Recruitment back into BC comes from a wide area of the Gulf of Alaska (Leaman, pers. comm.). Like rockfish, little is known about the population trends of flatfish. However, the populations are declining for the three species for which information exists: Queen Charlotte Sound Dover sole, English sole and rock sole (Booth, 1999). Halibut populations are also dropping and recruitment levels are expected to decline by 10-15% over the next 3-5 years (Leaman, pers. comm.).

Rockfish

Thirty-six species of rockfish (genus *Sebastes*) live off the coast of BC (Booth, 1999). Rockfish, commonly mistakenly called "rockcod," generally live in rocky areas with good cover. Habitats range from kelp forests in shallow sheltered bays, to depths of 300-400 m along steep slopes or flat hard bottoms. Some species grow up to 90 cm in length, although many grow to a maximum size close to half a metre (Lamb and Edgell, 1986). Rockfish are often long lived (some species > 100 years), but have low rates of production. Thus, many species can be easily overfished. Populations are unknown for most species (Booth, 1999).

Slope rockfish are generally found along the continental shelf, which is outside the LRMP area (*Ibid.*).

Other groundfish

The Lingcod (*Ophiodon elongatus*) is a member of the Greenling family. It lives over rocky bottoms, usually at depths between 10 and 100 m in areas of strong current (Booth, 1999). Lingcod are territorial and do not range far. As a result, little recruitment occurs from neighbouring populations. Thus this species must be protected from overfishing. Stock status is unknown in the planning area, although to the south in Queen Charlotte Sound, catch per unit effort has been declining since the late 1980s (Booth, 1999).

Sablefish (*Anoplopoma fimbria*) is long-lived migratory fish occurring off the coast of North America. Adults are generally found between 600-800 m (McFarlane and Beamish IN Booth, 1999), so they may not be common in the planning area. However, most juvenile sablefish in northern BC may be found in the nearshore habitats of Hecate Straight (Saunders *et al.*, IN Booth, 1999). Populations are thought to be stable (*Ibid.*).

3.4.4 Marine invertebrates (shellfish)

Invertebrates are animals without backbones. They generally have an outer covering or shell that provides body form and protection. Invertebrates are far more diverse and common than fish and mammals in the ocean. They include the clams, crabs, shrimps, starfish, worms and squid among many others. The larvae of most of these invertebrates are planktonic, floating with the currents, until they settle on suitable bottom habitat. As with fish, the invertebrates that tend to be studied are those associated with a fishery. Brief descriptions of the most important fished shellfish are found below. A summary table of these shellfish and the commercial shellfish industry is discussed briefly in section 4.5. Fishing.

Clams

Of the numerous species of clams found on BC shores and subtidally, four species are commonly gathered: the manila (*Tapes philipinaarum*), the littleneck (*Protothaca staminea*), the butter (*Saxidomus giganteus*), and the geoduck (*Panopea abrupta*) (Booth, 1999). The first three species are found on local beaches or in shallow subtidal areas. Population status is not known. The geoduck is a large clam found from the intertidal zone to depths of 110 metres. It buries up to a meter deep in silt, sand or gravel. The geoduck can live to over a 100 years and weigh over 9 kg (DFO, 1999b). Clams are filter feeders, straining microscopic plants and animals from the water. Clam beds have been mapped; however, harvest of clams is currently prohibited within the North Coast planning area.

Crabs

Over 80 species of crabs are found in BC. Only one is commercially fished to any extent: the dungeness crab (*Cancer magister*). It scampers along sandy bottoms usually < 50 m deep in areas of moderate and strong currents (DFO, 1999a). Its primary food is small clams (Kozloff, 1983).

Shrimp/Prawn

Seven species of shrimp, all belonging to the family Pandalidae, support fisheries: northern (or spiny) pink shrimp (*Pandulus borealis eous*), smooth pink shrimp (*P. jordani*), sidestripe shrimp (*P. dispar*), coonstripe shrimp (*P. danae*), humpback shrimp (*P. hypsinotus*), flexed pink shrimp (*P. goniurus*), and prawn (*P. latyceros*). Habitats differ by species and range from rocky bottom to mud and sand. Some species remain on the bottom, while others move off the bottom at night Shrimp generally spend their first year in shallow sheltered areas, after which they move offshore to depths up to 400m (Booth, 1999; DFO, 1999d 1999f). Shrimp populations are thought to be stable.

Red Sea Urchin

The red sea urchin (*Strongylocentrotus franciscanus*) is the largest of five species of sea urchins found in BC. It is found from the intertidal zone to depths of 50 m in rocky areas with moderate to strong currents. The adults graze on algae. The red urchin is fished for its roe, or eggs. Numbers of red sea urchins caught have been stabilized by quotas since 1992 (DFO, 1999e).

Giant Red Sea Cucumber

Of the approximately 30 species of sea cucumbers found in coastal waters of BC, the Giant Red Sea Cucumber (*Parastichopus californicus*) is the only one commercially harvested. It generally lives on the sea rocky floor from the intertidal zone to depths of 250 m. Juveniles to 10 cm tend to be found on the underside of rocks and in mats of stringy red algae. Cucumbers feed on organic detritus (particles of decayed material) (DFO, 1999).

Abalone

Only one species of abalone is found in BC – the northern abalone (*Haliotis kamtschatkana*). It lives on rocky reefs and may be found intertidally grazing on algae that coats rocks. Populations have declined since the early 1980s. Although harvesting of abalone has been closed since 1990, poaching may still be impacting the populations. The northern abalone is currently considered at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Booth, 1999).

3.4.5 Marine mammals

Three categories of marine mammals are found in BC waters: pinnipeds (seals and sea lions), cetaceans (whales, porpoises, and dolphins) and sea otters. Booth (1999) provides brief summaries for each of the primary species located within the Central Coast LRMP. Sea otters, although historically found along the BC coast, do not currently inhabit the North Coast LRMP area. The closest sea otter population is just south of the planning area at Goose Island and Gosling Rocks. If sea otters recolonize the north coast, they would likely be drifters from Alaska (Hetherington, pers. comm.).

Five species of marine mammals, including three categories or Orca (killer whales), are considered at risk within the planning area (Table 17).

Table 17. Marine mammals at risk in the North Coast LRMP area.

Species	**Risk ranking (CDC)**	**Provincial Rank**[17]	**Global Rank**[18]
Northern Sea Lion (*Eumetopias jubatus*)	Red-listed	S2B, S3N	G3
Orca Whale (*Orcinus orca*) resident ecotype	Blue-listed	S3	G4G5T3Q
Orca Whale (*Orcinus orca*) transient ecotype	Blue-listed	S3	G4G5T4Q
Orca Whale (*Orcinus orca*) offshore ecotype	Blue-listed	S3	G4G5TUQ
Humpback Whale (*Megaptera novaeangliae*)	N/A	S1N	G3
Gray Whale (*Eschrichtius robustus*)	N/A	S2N	G3G4
Minke Whale (*Balaenoptera acutorostrata*)	N/A	S3N	G5

One species of sea lion occurs within the planning area: Northern or Stellar's (*Eumetopias jubatus*) sea lion. The northern sea lion, which lives on rocky shores and the adjacent coastal waters, is Red-listed in British Columbia, partially the result of a population control program between 1913 and 1968. Its population appears to be increasing slowly in BC. However, the Alaskan population has plummeted by 82% since 1960. The intense mackerel and pollock fishery off the Alaskan coast is thought to be the primary contributing factor in this dramatic decline (Bryant IN Booth, 1999).

Three discrete communities (ecotypes) of killer whales occur in the planning area: resident, transient and offshore. These groups differ in their social structure, behaviour, appearance and genetics (Ford *et al.* In Booth, 1999). Resident groups, called pods, are close-knit family groups that tend to range over relatively small areas. These whales feed on salmon. Transients, as their name implies, travel in less stable groups over wider areas without an obvious seasonal pattern. These whales feed on porpoise, dolphins, sea lions, seals and baleen whales (Booth, 1999; McConnaughey and McConnaughey, 1985). Offshore orcas appear to travel in large groups of 30 – 60 animals and occasionally enter coastal waters (Booth, 1999). Little is known about these whales. All three types of orca are Blue-listed in BC.

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[17] **S1 = Critically Imperiled** provincially because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction.
S2 = Imperiled provincially because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction.
S3 = Vulnerable provincially either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations) , or because of other factors making it vulnerable to extinction.
S4 = Apparently Secure: Uncommon but not rare, and usually widespread. Possibly cause for long-term concern.
S5 = Secure: Common, typically widespread and abundant.
B = Breeding: The associated rank refers to breeding occurrences of mobile animals.
N = Non-breeding: The associated rank refers to non-breeding occurrences of mobile animals.

[18] **G3 = Vulnerable** globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations) , or because of other factors making it vulnerable to extinction.
G4 = Apparently Secure: Uncommon but not rare, and usually widespread. Possibly cause for long-term concern.
G5 = Secure: Common, typically widespread and abundant.
Q = Questionable taxonomy: Taxonomic status is questionable; numeric rank may change with taxonomy.
T = Infraspecific Taxon (trinomial): The status of infraspecific taxa (subspecies or varieties) is indicated by a "T-rank" following the species' global rank. Rules for assigning T ranks follow the same principles outlined above. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1.

Humpback whales are a migratory species, travelling south in the winter to calving and breeding grounds in Mexico and Hawaii. In summer they return as far north as the Aleutian Islands to feed (Leatherwood *et al.*,1982 IN Booth, 1999). Group sizes average one to three animals, and have been observed in aggregations of more than 20. Humpbacks tend to congregate near coastal areas and around oceanic islands (Nemoto, 1959). However, many near shore sightings also occur in Hecate Strait. Humpback whales are sighted more frequently by observers in boats than any other species of whale.

Gray whales breed in Baja California and migrate northward to feed, appearing in BC in spring. Northward migrants are seen concentrated near Cape Scott (Vancouver Island) before moving in a widely scattered migration across Queen Charlotte Sound, up Hecate Strait and out through Dixon Entrance. Some remain to summer in Hecate Strait. In northern coastal areas, they feed in small groups within the shallows on the south side of Rose Spit on the Queen Charlotte Islands/Haida Gwaii.

The Minke whale is a small baleen whale generally found over the continental shelf (McConnaughey and McConnaughey, 1985). Individuals are, however, sighted near the shore along the coast of BC. They feed on copepods and euphausiids and small schooling fish including herring and sandlance (Leatherwood *et al.*, 1982 IN Booth, 1999). Their distribution throughout the planning area is not known.

3.4.6 Seabirds

Thirty-nine species of seabirds occur along the coast of BC and Washington state. An additional 17 species occasionally visit from inland or oceanic habitats (Wahl *et al.*, 1993). Some are year-round residents while others migrate. Thirteen species breed on the outer coast of BC.

Seabirds appear to concentrate at fronts, outflows, areas of upwelling, and areas of seasonal prey concentrations (Wahl, *et. al.*, 1993). The number of seabirds generally decreases with water depth. Population abundances tend to vary from year to year; with the largest variations from normal distributions seen during El Niño events.

The impacts of human activities on seabirds in poorly understood. Activities related to the petroleum and commercial fishing industries may have the largest potential impacts on seabird populations. The impacts need to be studied (Wahl *et al.*, 1993).

Seven of these birds are considered "at risk" and are Red-, Blue- or Yellow-listed (Table 18). Three species are Identified Wildlife Species under the Forest Practices Code. See Section 3.2: Terrestrial Wildlife, for a summary of Identified Wildlife Species and a summary of the Marbled Murrelet National Recovery Strategy.

Table 18. Seabirds at risk in the North Coast LRMP area.

Species	Risk ranking (CDC)	Identified Wildlife Species
Marbled Murrelet (*Brachyramphus marmoratus*)	Red-listed	X
Horned Puffin (*Fratercula corniculata)*	Red-listed	-
Cassin's Auklet (*Ptychoramphus aleuticus*)	Red-listed	X
Pelagic Cormorant (*Phalacrocorax pelagicus pelagicus*)	Red-listed	-
Tufted Puffin (*Fratercula cirrhata*)	Blue-listed	-
Ancient Murrelet (*Synthliboramphus antiquus*)	Blue-listed	X
Rhinoceros Auklet (*Cerorhinca monocerata*)	Yellow-listed	-

3.4.7 Important coastal habitat features

3.4.7.1 Estuaries

Estuaries occur at the mouths of rivers where outflowing freshwater mix with the ocean tides. These areas of interface between freshwater and marine ecosystems, although they represent a relatively small proportion of the coast, are highly productive for both terrestrial and marine wildlife. As such, they provide extremely high habitat values for a range of species.

The size and form of individual estuaries vary depending on volume and sediment carrying capacity of the contributing river(s) and form and exposure of the shoreline. The vegetated intertidal areas of estuaries contrast markedly with the forested upland and bog woodland ecosystems typical of the North Coast. This provides landscape diversity and important forage diversity that is preferentially used by many wildlife species, including river otter, mink, black-tailed deer, and black and grizzly bears. Estuaries are critical habitat features for bears, providing high value early spring emergent vegetation (e.g., sedge grasses) as well as an abundance of salmon in the summer and fall (Vanderstar, per comm.).

Estuaries are often associated with rare plant communities that exist in complexes of old seral forest and estuary (Hetherington, pers comm.). Estuarine plant communities characteristic of the northern British Columbia coast include Lyngbye's sedge marshes, Widgeon-grass mudflats, Tufted hairgrass meadows, Sitka willow riparian thickets, and Pacific crabapple "orchards", among others.

Stream inputs of organic matter and micro-nutrients such as iron into estuaries make these the most productive areas of the ocean environment. Extremely high plankton productively feeds large populations of benthic and water-column invertebrates that feed fish and birds.

Estuaries provide critical rearing areas for juvenile salmonids as they make their physiological transition from fresh- to saltwater. The rich estuarine environment provides ample prey and cover for the juveniles during this vulnerable phase of their life cycle. Chum and chinook salmon are the most common species to rear in estuaries. Several northern estuaries also support the spawning of eulachon and Pacific herring.

Estuaries are used extensively by waterbirds that feed on estuarine plants, invertebrates and fish. Colonial breeding seabirds, such as Cassin's Aucklet, Rhinoceros Auklet, Ancient Murrelet, and Tufted Puffin, use estuaries as well as islands, islets, and cliffs. Trumpeter Swans and Barrow's Goldeneyes use estuaries and shores as winter habitat. These areas are also stopovers along the migration route for millions of shorebirds and waterfowl. The North Coast is part of the Pacific flyway, providing feeding and rest stops for birds en route between southern overwintering areas and northern breeding grounds. Some of these estuaries are critical overwintering areas and the quality of the estuary can have a great influence on the health of certain flocks (Remington, 1993).

3.4.7.2 Kelp beds

Kelp beds occur in upper subtidal marine areas with rocky bottoms and exposure to wave action. Kelp are large, brown algae that cling to rocks with strong holdfasts and that draw nutrients directly from ocean waters and catch the sunlight near the ocean surface with their long, flat fronds. Kelp are highly productive, growing up to 60 centimetres a day (Cannings and Cannings, 1996). Kelp grow in forests that provide shelter and feeding areas to many marine species. Kelp are grazed by sea urchins and a variety of fish species. Over-grazing of kelp beds by sea urchins has resulted in a reduced abundance in kelp in many areas. This is due to the extirpation of sea otters from many areas in the North Pacific. Sea otters feed on the sea urchins and are their main predator.

Kelp beds and eelgrass beds play an important role in the spawning of Pacific herring. Every spring, schools of herring spawn in sheltered bays along the coast. The eggs stick to the marine plants and eagles, sea lions, waterfowl and even whales are attracted into the bays to feed on the herring roe. Several First Nations communities along the coast run herring roe operations, where they harvest the roe from the kelp beds for commercial food purposes.

3.4.7.3 Eel grass beds

Eel grasses are flowering plants that grow on subtidal silt beds in shallow coastal bays. Seagrasses grow in thick patches that slow wave action and currents, resulting in an accumulation of sediments. This results in seagrass beds being highly productive relative to adjacent unvegetated areas and they act as key primary production units in inshore waters. Eel grass beds provide habitat to numerous fish and inveretebrate species and are important for grazing by waterfowl such as the brant and American wigeon.

3.4.7.4 Other areas of significance

Other areas of consideration in the coastal nearshore include the following. All of these areas provide productive marine habitat.

- Areas that experience significant tidal currents e.g., narrows between bays and the ocean or congestion between islands
- Lagoons
- Other areas having restricted tidal flows.

4.0 RESOURCE USES

4.1 Culture and heritage

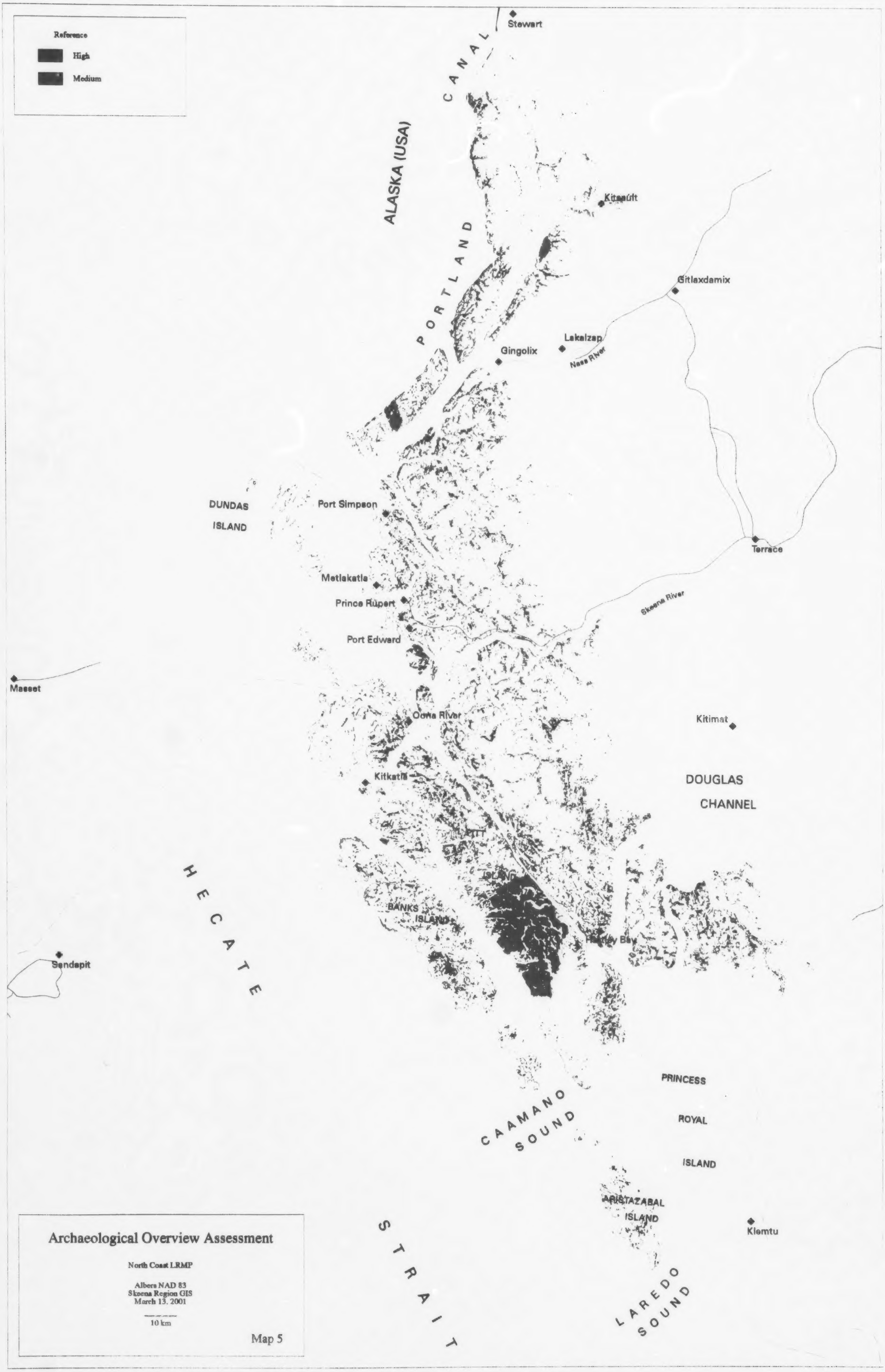
4.1.1 First Nations cultural heritage resources

First Nations have lived and carried out activities throughout the LRMP area for tens of thousands of years. Cultural heritage resources are protected under the *Heritage Conservation Act*. These resources include all pre-1846 features such as archaeological sites and artifacts, culturally modified trees (CMTs), aboriginal rock art, and burial places. The Ministry of Small Business, Tourism and Culture, Archaeology Branch manages archaeological sites and information under the *Heritage Conservation Act*.

Archaeological Overview Assessments (AOAs) have been completed by the Ministry of Forests for much of the North Coast TSA and for the North Coast portion of TFL 25. AOAs assess the potential for occurrence of cultural heritage resources and direct more detailed archaeological impact assessments in areas of moderate or high potential where forestry activities are planned. AOAs completed in the North Coast indicate that many of the lower elevation areas have high or moderate potential for the existence of archaeological sites or resources (Map 5). The highest potential occurs along main rivers and shorelines. This potential is assessed based on known information about archaeological sites combined with geographical information such as topography, distance from waterways, etc. For the most part development of the AOA is a technical exercise with some input from First Nations. It is a living inventory that will change as more information becomes available and additional input is provided by First Nations and licensees. The assessments for the North Coast are currently being updated to meet resource inventory standards.

If an area is identified as high in the AOA, any development must be preceded by a detailed archaeological impact assessment. If an area is identified as moderate on the AOA, a less detailed archaeological field reconnaissance exercise is required prior to development. When cultural heritage resources are inadvertently encountered during development activities, there is a legal requirement to report the discovery and to cease activities until the significance of the find can be evaluated. The North Coast Forest District has frequently adjusted its development plans to avoid archaeological sites or resources (MOF, 1998a). Strategies to address these resources are determined on a site-specific basis.

Mineral exploration specifically addresses cultural heritage resources in the application for a *Mines Act* permit and First Nations are consulted regarding proposed exploration programs. In the case of mine development, consultation with First Nations is required to identify archaeological sites and assess potential impacts of the proposed mining operation.



Archaeological Overview Assessment

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

Map 5

Traditional use sites are those with cultural importance to First Nations. These sites are not necessarily associated with past physical remains and may or may not be currently used by local First Nations communities. Examples include fishing sites, hunting camps, traditional trails, berry-picking areas, and legend or sacred sites. Although traditional use sites are not formally protected, government has a legal obligation to consult with First Nations where land-altering activities may interfere unjustly with the aboriginal right(s) to practice traditional activities.

Traditional use studies (TUS) have been completed by the Kitkatla First Nation on the outer coast, the Allied Tsimshian Tribes Association, and the communities of Kitselas and Kitsumkalum. Metlakatla, Kitasoo, and the Haisla will have their TUS completed in 2001. While the Archaeological Overview Assessment is public information, First Nations may bring forward information on traditional use and archaeological resources at their discretion.

Traditional use information is useful in providing information about wildlife and fish populations and locations over time, as well as resource management activities that occurred prior to the arrival of Europeans. These activities may have altered ecosystems prior to the changes brought by European settlement (e.g., burning to enhance berry production).

North Coast First Nation cultures had an extensive trade network. These routes were by river and ocean and via land trails to the Interior. Many of these trails were used during European movement into the area and were later developed into roads and highways. There are some remaining traditional trails in the area but these are not maintained or restored, e.g., the Gitga'at Trail, a portage from Kitkiata to the headwaters of the Ecstall River en route to Prince Rupert.

Some local First Nations are involved in tourism operations to highlight the cultural heritage values in the North Coast. These are described in more detail in Section 4.4: Recreation, Tourism and Visual Quality.

4.1.2 Non-aboriginal historic features

The non-aboriginal history in the North Coast extends over one hundred years. Early settlement in the Prince Rupert area was built around the Grand Trunk Railway and the fishing industry. There are a number of historic sites dotted throughout the plan area that are the ghosts of industries that once thrived and then moved on. Traces of the many canneries that once operated on the coast remain. Some of the historic cannery sites are marked; others are not. The North Pacific Cannery is now a museum and National Historic Site. The remains of Port Essington, an abandoned community with two fish canneries, are located on the southern banks of the Skeena River. Port Essington once promised to be the main townsite in North Coast. Haysport, located across the river from Port Essington, is another abandoned community that was once used as a fishing camp.

Other historic features can be found on the islands around Prince Rupert. Hospital Island is named for a Quarantine Hospital built on the island in 1912 in anticipation of an influx of immigrants from overseas. Nearby, Digby Island has trails leading to old WWII forts. At Wales Island, on the north end of the Portland Canal, is an old stone house that was built during the 1880s to store munitions.

In the northern portion of the plan area, several old mining towns and mining infrastructure remain from extensive mining operation conducted in early part of the 1900s. The Regional District of Kitimat-Stikine recently published a brochure describing the history of the former town of Anyox, located in Observatory Inlet, that was built in the early 1910s to service a copper mining and smelting operation that operated until the mid-1930s. Traces remain of narrow gauge railways constructed from the town of Alice Arm along the Kitsault River to access silver mines to the north. Two books are published on the history of the Anyox-Kitsault area, one focusing on Anyox, the other on the Dolly Varden railway and silver mines.

4.1.3 Strategic planning issues related to cultural and heritage resources

- ☐ Maintaining the integrity of aboriginal and non-aboriginal cultural heritage resources.

4.2 Forestry

Much of the data in this section will be presented for the North Coast Timber Supply Area (TSA) rather than the LRMP area. A full analysis of forestry data was not possible for the LRMP area in the time available to prepare this report.

The entire North Coast TSA covers approximately 1.96 million ha. Of the total landbase in the TSA 758,888 ha (38.7%) is considered productive Crown forest land. Only 6% of the total landbase (15.5% of the forested landbase) is considered operable. A large proportion of the forested landbase is not considered operable due to the ruggedness of the terrain and difficulty of accessing wood. Other factors contributing to inoperability are unstable terrain and private land. The timber harvesting landbase is shown in Map 6. This map is from data compiled for the 1995 timber supply review (TSR1) and is somewhat out of date. However, it does show the limited area of operable landbase, with operable land almost entirely in valley bottoms or along the shoreline.

4.2.1 Current tenures

The Allowable Annual Cut (AAC) for the North Coast TSA is 573,624 m^3, set in October 2000. The previous AAC, set in 1995, was 600,000 m^3. The 2000 AAC takes into account the permanent transfer of 61,000 ha (equivalent to 25,600 m^3 of timber) from the North Coast Timber Supply Area to form part of Nisga'a Lands under the Nisga'a Treaty. The AAC has also been adjusted to account for 776 m^3 allocated to woodlot licenses. The new allowable annual cut specifies that 154,000 m^3 will come from areas that have had little harvesting in the last 15 to 20 years, such as the area north of the Nass River and some scenic areas.

The 1999 timber supply analysis of the North Coast TSA estimates that the current AAC can be maintained for up to 20 years, followed by a 10% reduction per decade over the following 40 years (MOF, 1999). This is lower than the forecast in the 1994 analysis, primarily due to a re-inventory that reduces estimates of the standing timber volume by 17% (MOF, 1999). The projected Long Term Harvest Level for the North Coast TSA under current management is 338,000 m^3/yr (MOF, 1999).

The AAC for the North Coast TSA is divided into five forest licenses. Map 7 shows the allocation of forest tenures based on the 1995 AAC (the allocation based on the 2000 AAC will not be determined until 2001). Large portions of the area remain unallocated and could provide potential timber supply areas in the future. The apportionment of the 1995 AAC is shown in Table 19. Four companies have replaceable forest licences, which accounted for 438,918 m^3 or 73% of the total AAC in 1995. The remainder is allotted to several other forms of tenure, including the Small Business Forest Enterprises Program and woodlot licences. The Forest Service Reserve is a portion of the AAC left unallocated to allow removal of timber under special licenses such as salvage of wood following major blowdown events or to allow local crafts people one-off opportunities to harvest timber.

In 2000, the Lax Kw'alaams First Nation was awarded a non-replaceable forest licence. The allocation for the tenure is 22,000 m^3/year for 10 years.

Table 19. Apportionment of the Allowable Annual Cut determined in 1995.

Tenure	Tenure holder	Allocation (m^3/year)	% of AAC
Forest Licenses (replaceable)	International Forest Products	226,617	37.8
	West Fraser (now Triumph Timber)	161,449	26.9
	Boyle and Dean Logging	20,156	3.4
	Thomson Industries	30, 696	5.1
Small Business Forest Enterprise Program –	Individual timber sale licences	149,082	24.8
Forest Service reserve		6000	1
Woodlot licenses		6000	1
TOTAL		**600,000**	**100.0**

Source: MOF, 1999

Timber Licences

As of 1998 there were four Timber Licence areas in the TSA, comprising 843 ha. Timber Licences are old tenure arrangements whereby a licensee owns the timber in an area but not the land the timber is growing on. The land reverts to the Crown as stands are harvested. By 2001, 314 ha of the existing Timber Licences will have reverted to the Crown and become part of the timber harvesting landbase (MOF, 1998).

Tree Farm Licence 25

A portion of Tree Farm Licence 25 is in North Coast Forest District. Approximately one quarter, or 195,000 m^3/yr, of the 779,000 m3/year AAC allocated to TFL 25 is available for harvest in North Coast. 65,336 ha of Block 5, the North Coast portion of TFL 25, is included in the North Coast LRMP. The remainder of Block 5 is being addressed in the Central Coast LRMP.

Non-Tenured Sources of Timber

Other sources of timber in the LRMP include private lands (25,000 m^3/year and First Nations reserves (27,000 m^3/year) (MOF, 1999).

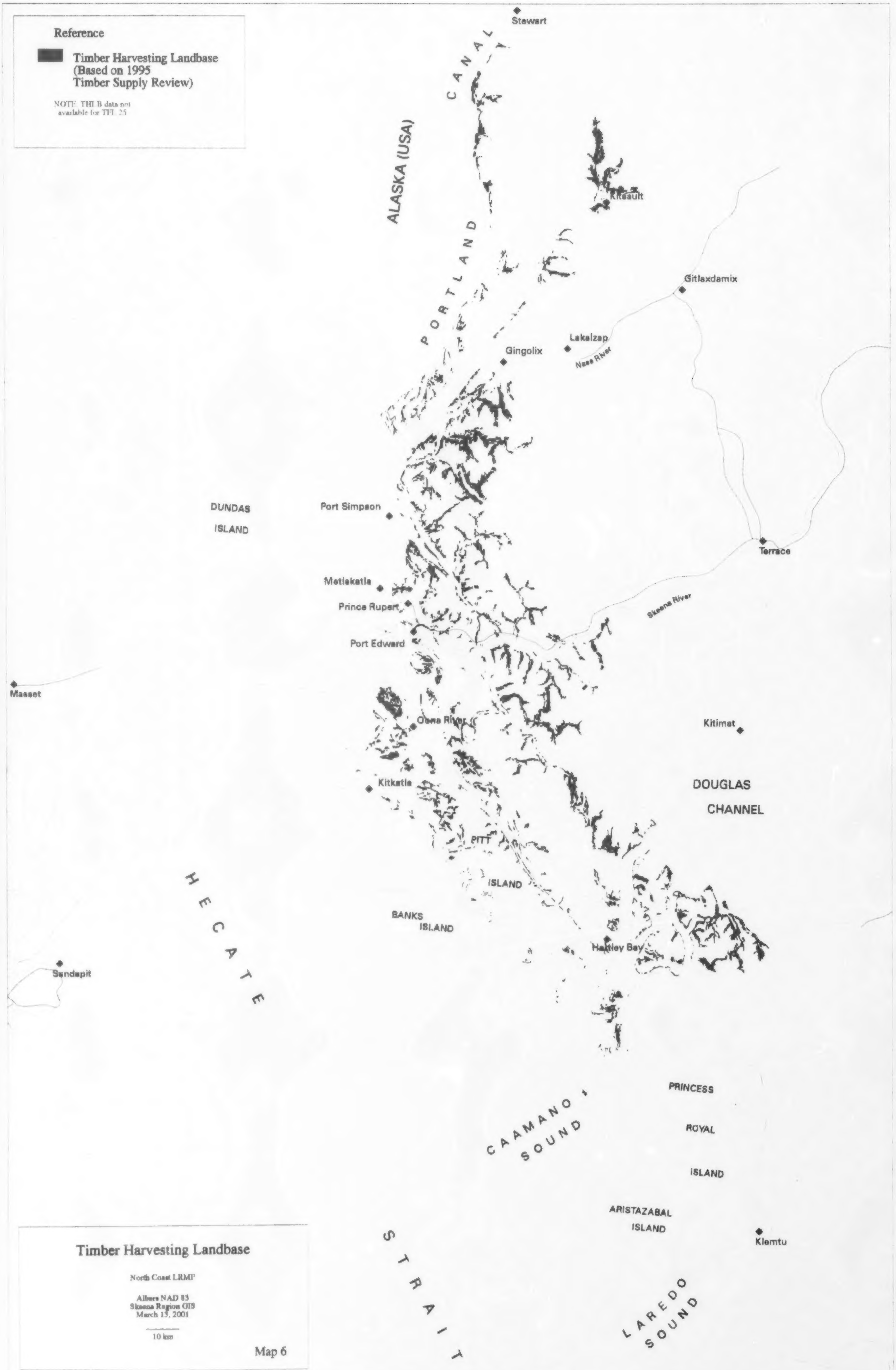
4.2.2 Timber harvesting

Merchantable tree species found in the TSA include western hemlock, western redcedar, amabilis fir, Sitka spruce, yellow-cedar, and cottonwood. The forests in the TSA are very old, with approximately 95% of the stands being older than 140 years and a large majority being over 280 years. The natural stand level disturbance return interval is around 1000 years (Steventon, pers. comm.). Most of the harvesting occurs in low elevation forests in the Coastal Western Hemlock zone. In isolated valleys, harvesting operations are most often accessed from the water. Due to the high costs of operating in these remote areas, licensees prefer to harvest small drainages in a single pass, harvesting both sides of the valleys. Much of the shoreline has already been harvested, although there is potential for logging in some areas in the future e.g., salvage logging and second rotation harvesting from the water.

Due to the rugged terrain, road construction for forestry operations is difficult and expensive. Most harvesting is done by hand felling trees and extracting them with the use of conventional (non-aerial) systems such as cable systems (83%) and helicopters (17%) (MOF, 1998). Depending on the harvesting system selected, the timber can be yarded (by A-frames or helicopters) directly to the ocean. Where roads have been built, the timber is trucked to the log dump, where it is watered, boomed and towed or loaded onto log barges. The timber is then transported to local, regional and coastal facilities for processing, sale or trades.

By far the greatest proportion of harvesting occurs using clearcutting regimes. Traditionally, only a very small amount of the TSA has been harvested using partial cutting, although the use of alternative silvicultural systems is increasing. The SBFEP program in the North Coast Forest District is experimenting with the use of variable retention and in 2001 approximately 28% of the AAC for the Small Business program is planned to be harvested using non-clearcut systems (Hedges, pers comm.). The Small Business program will continue to experiment with the use of variable retention systems as appropriate to the ecological conditions and economic feasibility of the sales. In past years, a large proportion of the tidewater-based logging for the SBFEP involved partial cutting using hand logging. This practice tended to result in high-grading of the larger, more readily accessible timber and has been phased out entirely (Hedges, pers comm.).

All of the harvesting to date has been of old growth forest. There is no experience in the district of harvesting second-growth stands.



Reference

▇ Timber Harvesting Landbase (Based on 1995 Timber Supply Review)

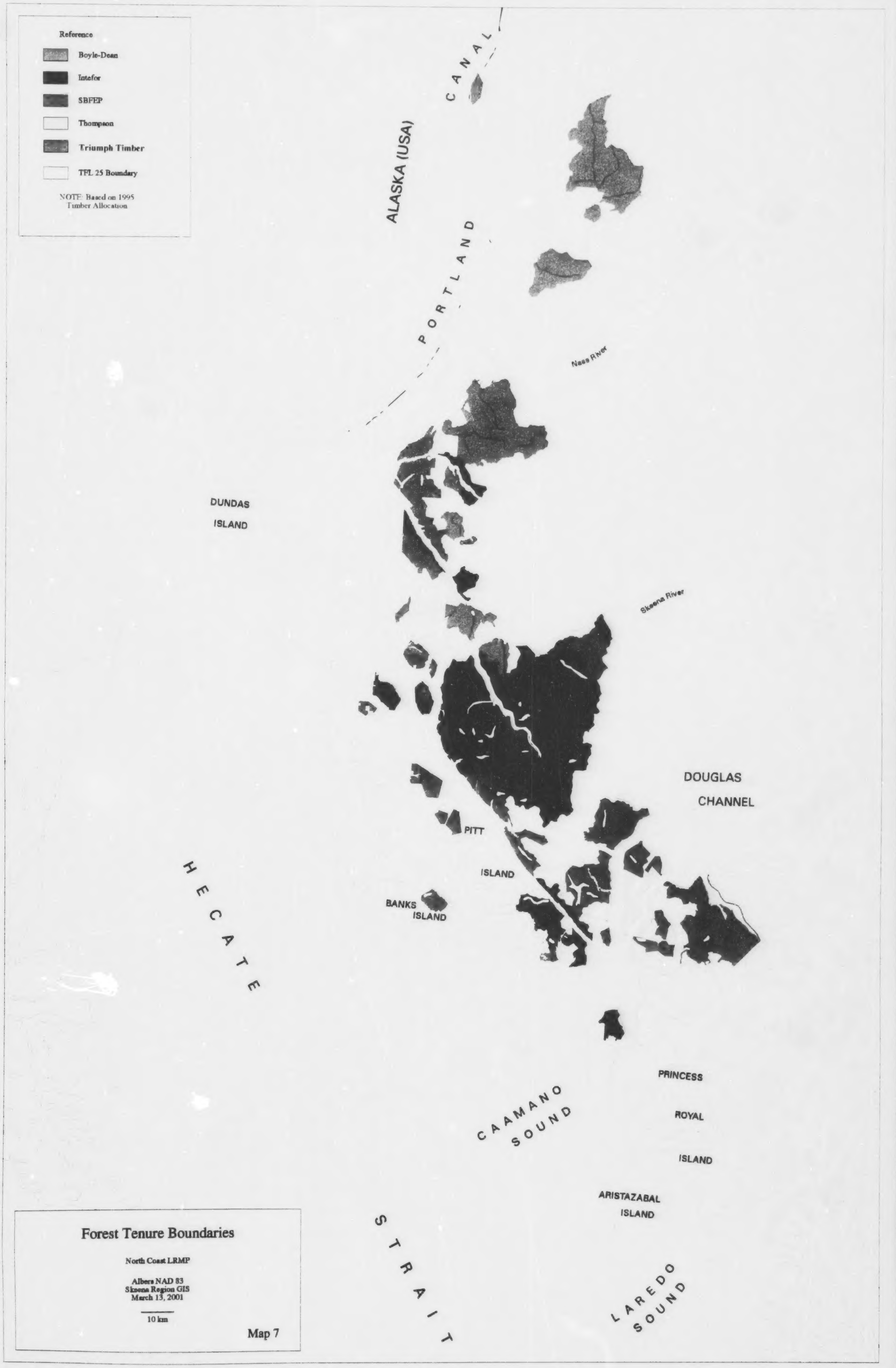
NOTE: THLB data not available for TFL 25

Timber Harvesting Landbase

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 15, 2001

Map 6



Forest Tenure Boundaries

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

Map 7

4.2.3 Harvesting operability

The map of the timber harvesting landbase for the North Coast (Map 6) gives an indication of the limited amount of operable land in the plan area (approximately 6% of the total landbase and 15.5% of the forested landbase). Operability is determined based on the presence/absence of physical barriers or limitations to harvesting, the types of logging methods used, and the merchantability of stands (MOF, 1999). The operable area includes areas harvested by conventional (ground-based) methods and by helicopter.

Operability lines can change depending on the available technology and the market value of commercial timber. The most recent operability mapping for the North Coast was done in 1994 by Strathinnes Forest Consultants. Updated operability mapping is underway and will be completed in 2001.

4.2.4 Silviculture

Most of the harvested areas are planted however there is a significant amount of natural regeneration within planted stands (primarily Western Hemlock). Some of the purposes for planting include: to ensure that there is a species mix after harvesting; to help reduce the amount of brushing required; and to reduce the number of voids. The average regeneration delay is one to two years. Manual brushing of vegetation is most common in preparation for planting; however, herbicides are also used infrequently.

Much of the outer coast landscape contains poorly-drained low productivity cedar-hemlock forests. These forests contain significant amounts of timber, including high quality western redcedar and yellow-cedar, that are particularly valuable for value-added and specialty markets. These forests are not being harvested at present due to uncertain economics and concerns about the feasibility and sustainability of removing forest cover from such wet, slow-growing forests. The forest district is currently in the third year of a five-year research project to assess the ecology and to develop management guidelines for sustainable harvesting in poorly drained, lowland Cedar-Cypress-Hemlock forests (MOF, 1998).

4.2.5 Agents of change

With a high rate of precipitation, wildfires are rare. Only 3.35 ha (2034 m^3/yr) of timber have been lost to fire per year, based on a 20 year average (MOF, 1999). The amount of timber lost to blowdown is also very low, with an estimated 1% annual rate of loss (*Ibid.*). Blowdown occurrences tend to be scattered and small in size. The North Coast District does salvage some of the blowdown, however the recovery program is not comprehensive.

Losses to insect and disease pests are considered negligible. Dwarf mistletoe is found in localized pockets e.g., on Banks Island.

Porcupines may impede the successful regeneration of younger second-growth stands in some areas. Their range extends over two-thirds of the TSA, predominantly in the north. Porcupines feed on 25 – 50- year old spruce and hemlock and either kill trees outright, retard their growth, thereby extending the regeneration time, or reduce the stem quality to a nonmerchantable state[19]. Some options for addressing this problem include maintaining high site densities until the trees are no longer vulnerable or replanting with less vulnerable species. Minimizing the size of second growth stands may limit favourable conditions for expansion of porcupine populations (Vanderstar, pers. comm.). FRBC is funding further studies on the impact of porcupine in the TSA.

4.2.6 Forest management and biodiversity

The forests in the North Coast are of a natural disturbance regime where large catastrophic disturbances are rare and forest succession occurs, for the most part, by a random process of tree death and replacement. The resulting forests are very old with a mix of tree ages. Large openings are rare. Map 8 shows the current age class distribution, indicating the large amount of old and mature forest across the landbase. As can be seen, most of the early seral forest (< 40 years old) is in valley bottoms, where logging and settlement has occurred. The valley bottoms and lowland river areas are historically where the largest trees and most productive ecosystems are found.

Forestry activities change the structural composition of coastal forests. Clearcutting is the preferred industrial method of harvesting in coastal terrain and conditions. This silvicultural system creates large openings, replaced by more even-aged stands. Over time, the profile of the forest in the timber harvesting landbase will change. The long-term effect of harvesting will be a landscape mosaic where the operable areas (predominantly in valley bottoms) are in second growth, managed stands (80 - 100 years old) interspersed with Riparian Reserve Zones, Wildlife Tree Patches, non-operable leave zones and other special leave zones. Forest outside of the timber harvesting landbase will continue to cycle through natural disturbance processes in a mosaic of age classes, with older age classes (> 250 yrs) dominating.

Landscape units and biodiversity planning

The North Coast Forest District has mapped draft landscape units and assigned draft biodiversity emphasis options for the entire district, including TFL 25 consistent with the direction in the *Landscape Unit Planning Guide* (1999) (Map 9). Landscape units are planning areas established under the Forest Practices Code for the purposes of applying biodiversity objectives. Landscape unit boundaries were identified based on a number of factors, including heights of land, watershed groupings, major lakes and rivers, groups of islands, and significant coastal water barriers such as channels, inlets, and sounds. In the North Coast the boundaries of some landscape units were modified to accommodate the functionally distinct Skeena Islands and Nass units[20].

Draft biodiversity emphasis options (BEOs) were assigned to each landscape unit based on ecological and socio-economic criteria (Table 20). BEOs define the amount of old growth retention that should occur in a landscape unit. In general, the higher the BEO, the greater the conservation values in the unit and the greater the amount of old growth retention.

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[19] Note: Porcupines contribute to structural diversity in second growth forests and may provide beneficial habitat attributes for some wildlife species such as black-tailed deer (Liepins, pers comm.).

[20] Note: the Nass LU is within the proposed Nisga'a Lands and is outside of the LRMP

The assignment of BEOs to landscape units in the North Coast district was primarily based on the "biodiversity value ranking" of each unit in terms of ecosystem complexity, connectivity, ecosystem representation, current condition, and presence of Identified Wildlife, red- and blue-listed communities, and anadromous fish-bearing streams. The biodiversity value ranking was weighed against a timber ranking that included a consideration of economic viability, previous investments in engineering and silviculture, operability, and existing reserves and management constraints (Table 20). Because of differences in ecosystem dynamics, islands were evaluated for biodiversity values separate to the mainland.

The following landscape units have been assigned a high BEO in the North Coast LRMP area.

- Hevenor
- Khtada
- Kitkiata
- Kshwan
- Kumealon
- Skeena Islands

Biodiversity planning in British Columbia is based on the assumption that "the more that managed forests resemble the forests that were established from natural disturbances, the greater the probability that all native species and ecological process will be maintained."

There are six basic elements of biodiversity planning under the Forest Practices Code. These include the following:

Old growth retention

Areas of old forest, called old growth management areas (OGMAs), are identified in each landscape unit and set aside from timber harvesting. The amount of old growth included in OGMAs in each landscape unit is defined by the BEO for the landscape unit (see Table 20). Where possible, OGMAs are located outside of the timber harvesting landbase or in areas of minimal impact to timber supply. Old growth representation in OGMAs is by biogeoclimatic variant.

Wildlife tree retention

Wildlife trees are standing live and dead trees that provide habitat for many species of wildlife, birds and invertebrates. Stand structure is retained within individual cutblocks, either as individual trees or as patches of trees. Targets for wildlife tree retention within each cutblock are determined by landscape unit and are based on previous harvesting patterns.

Seral stage distribution

Seral stage distributions provide a variety of different-aged forests across a landscape. Targets for seral stage distribution are intended to maintain a minimum amount of forest in mature and old condition and to set a limit on the amount of early seral forest (younger than 40 years).

Distribution of cut and leave areas over space and time

The pattern and timing of timber harvesting has a large influence on the size and distribution of forest patches across the landscape. Patch size targets permit a range of opening sizes, from small to very large, with the intent of mimicking the range of natural patterns of disturbance across the landbase as well as providing economic efficiency for harvesting operations.

Connectivity

Connectivity is provided by continuous areas of mature and old forest cover. In the mountainous topography of the coast, where contiguous blankets of old forest cover are the norm, important elements of connectivity include riparian areas and forested cover linking watersheds (e.g., over low elevation passes) and connecting valley bottom and upper elevation areas.

Species composition

The intent of objectives for species composition is that a significant component of the landscape unit be maintained in communities with plant species composition similar to that in communities that have developed through natural succession. This includes maintaining a mix of deciduous and coniferous trees, where appropriate. The maintenance of species composition is not a significant issue in coastal forest management.

Under current policy, as outlined in the *Landscape Unit Planning Guide* (1999) old growth retention and wildlife tree retention are priorities for biodiversity planning. In the absence of direction from an LRMP or higher level plan, objectives for other biodiversity elements (patch size distribution, seral stage distribution, including targets for mature seral retention and early seral, and landscape connectivity) and other forest resources can only be developed in draft form and must not create timber impacts in excess of government policy.

Table 20 summarizes the status of biodiversity planning for landscape units in the plan area. For the most part, there is enough old forest in each landscape unit to meet targets for old growth retention. The exceptions are Anyox, Campania, Olh, and Stagoo. In all four of these landscape units, the lack of old growth is due to the natural range of forest age classes and not to historic logging activities.

Note that almost all of the BEC variants in the North Coast are classified as natural disturbance type 1 (NDT1). Natural disturbance types describe the natural disturbance regime for an area. In NDT1, forest ecosystems are historically uneven-aged or multi-storied even-aged with regeneration occurring in gaps created by the death of individual trees or small patches of trees. Large stand-replacing events are rare. The mean return interval for disturbances in the NDT1 is 250 – 350 years (MOF and MELP, 1995a).

Table 20. Seral stage distribution by natural disturbance type (NDT)[21].

Landscape unit	Biodiversity rank	Timber rank	BEO	NDT	BEC variants
1. Anyox	0.4	0.12	L	1	CWHwm, MHmm1
2. Aristazabal	0.6	0.1	I	1	CWHvh2
3. Banks	0.7	0.1	I	1	CWHvh2, MHwh1
4. Belle Bay	0.8	0.31	I	1	CWHvh2, CWHwm, MHmm1, MHwh1
5. Big Falls	0.5	0.88	L	1	CWHvm, MHmm1
6. Bishop (TFL 25)	0.5	0.89	L	1	CWHvh2, CWHvm1, CWHvm2, MHmm1
7. Brown	0.7	0.43	L	1	CWHvh2, CWHvm, MHmm1, MHwh1
8. Campania	0.7	0.2	I	1	CWHvh2, MHwh1
9. Captain	0.6	0.5	L	1	CWHvh2, MHwh1
10. Chambers	0.9	1	I		CWHvh2, CWHvm, MHmm1, MHwh1
11. Crab	0.5	0.74	L	1	CWHvm1, CWHvm2, MHmm1
12. Dundas	0.5	0.1	L	1	CWHvh2
13. Gil	0.6	0.3	L	1	CWHvh2, MHwh1
14. Gribbell	0.6	0.5	L	1	CWHvh2, MHwh1
15. Hartley	0.9	0.39	I		CWHvh2, CWHvm, MHwh1
16. Hawkes	0.7	0.4	I	1	CWHvh2, MHwh1
17. Hevenor	0.8	0.3	H	1	CWHvh2, MHwh1
18. Johnston	0.9	0.54	I	1	CWHvm, MHmm1
19. Kaien	0.8	0.73	L	1	CWHvh2, CWHvm, MHmm1, MHwh1
20. Khtada	1	0.48	H	1	CWHvm, MHmm1
21. Khutzeymateen	0.9	0.13	Park	1	CWHvm, CWHwm, MHmm1
22. Khyex	0.8	0.27	L	1	CWHvm, MHmm1
24. Kiltuish (TFL 25)	0.6	0.62	L	1	CWHvm1, CWHvm2
25. Kitkiata	1	0.6	H	1	CWHvh2, CWHvm, MHmm1, MHwh1
26. Kitsault	0.9	0.87	I	1	MHmm1, MHmm2
				2	CWHws1, CWHws2
27. Klekane	0.7	0.6	L	1	CWHvm, MHmm1

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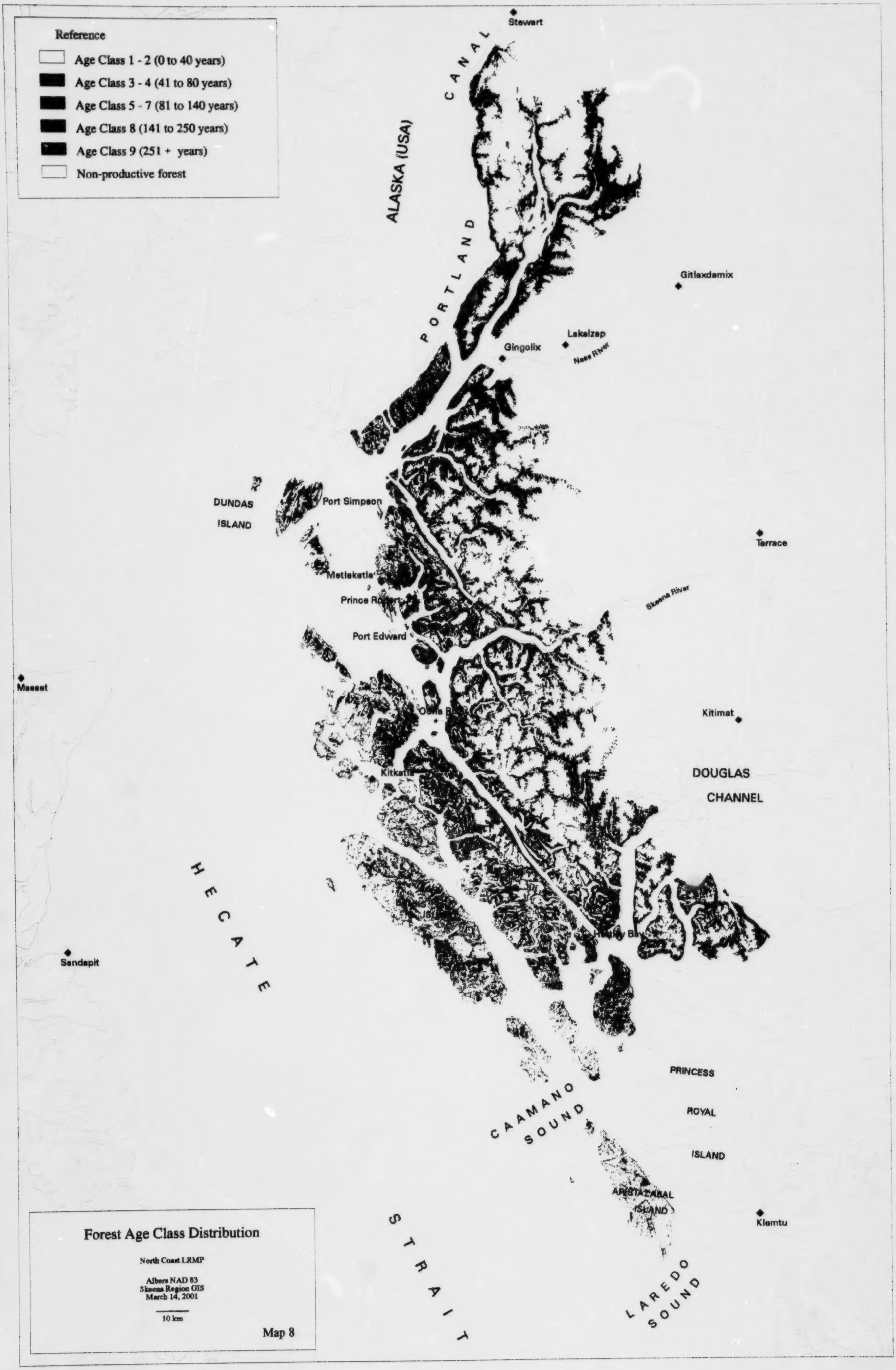
[21] The definition of old seral is >250 years in NDT2 and >140 years in NDT3. Mature seral is 120 – 250 years in NDT2 and 100 - 140 years in NDT3. Early seral is less than 40 years for all NDT types.

Landscape unit	Biodiversity rank	Timber rank	BEO	NDT	BEC variants
28. Kshwan	0.7	0.12	H	1	CWHwm, MHmm2
29. Kumealon	1	0.92	H	1	CWHvh2, CWHvm, MHmm1, MHwh1
30. Kwinamass	0.8	0.9	I	1	CWHvm, MHmm1
31. Marmot	0.6	0.39	L	1	CWHwm, MHmm1, MHmm2
32. Monckton	0.5	0.1	L	1	CWHvh2, MHwh1
33. McCauley	0.6	0.1	L	1	CWHvh2
34. Observatory E	0.5	0.17	L	1	CWHwm, MHmm1
35. Observatory W	0.5	0.18	L	1	CWHvh2, CWHwm, MHmm1, MHwh1
36. Olh	0.4	0.12	L	1	CWHwm, MHmm1
				2	CWHws1, CWHws2
37. Pa-aat	0.7	0.2		1	CWHvh2, MHwh1
38. Pearse	0.7	0.3	L	1	CWHvh2, MHwh1
39. Porcher	0.7	1	L	1	CWHvh2, MHwh1
40. Quottoon	0.9	0.64	I	1	CWHvh2, CWHvm, MHmm1, MHwh1
41. Red Bluff	0.6	0.3	L	1	CWHvh2, MHwh1
42. Scotia	0.7	0.84	L	1	CWHvh2, CWHvm, MHmm1
43. Skeena Islands	0.6	0.34	H	1	CWHvm, MHmm1
44. Somerville	0.9	0.77	I	1	CWHvh2, CWHvm, MHmm1, MHwh1
45. Sparkling	0.9	0.3	I	1	CWHvh2, CWHvm, MHmm1, MHwh1
46. Stagoo	0.8	0.48	I	1	CWHwm, MHmm1
				2	CWHws1, CWHws2
47. Stephens	0.4	0.1	L	1	CWHvh2
48. Triumph (TFL 25)	0.5	0.81	L	1	CWHvm1, CWHvm2, MHmm1
49. Trutch	0.5	0.1	L	1	CWHvh2
50. Tuck	0.7	0.77	L	1	CWHvh2, MHwh1
51. Union	0.7	0.67	L	1	CWHvh2, CWHvm, MHmm1

(North Coast Forest District, 1999)

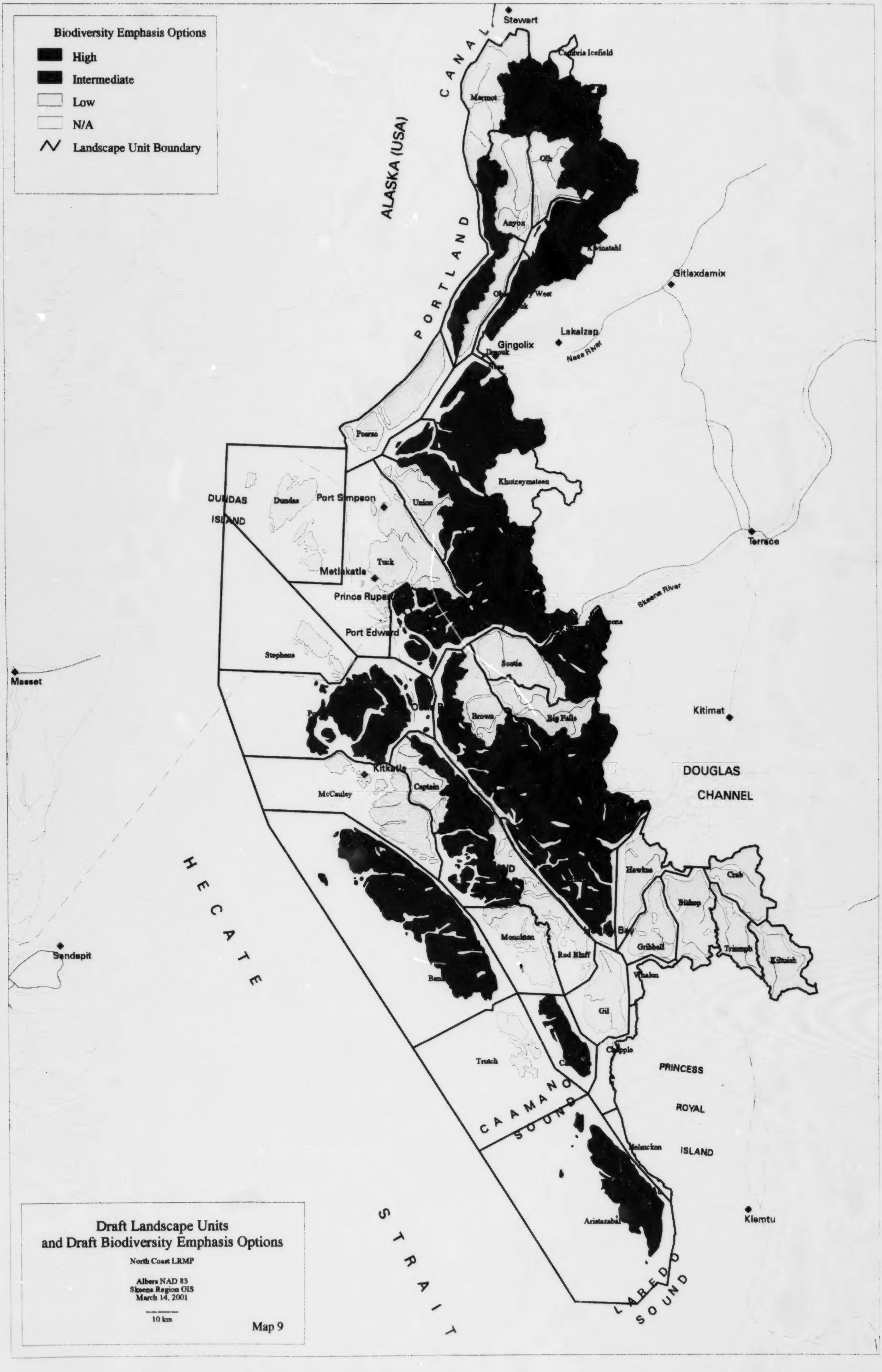


Forest Age Class Distribution

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

Map 8



Draft Landscape Units and Draft Biodiversity Emphasis Options

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

10 km

Map 9

4.2.7 Strategic planning issues related to forestry

- The North and Central Coasts have been the focus of international attention by environmental organizations, which are seeking a new approach to logging coastal temperate rainforest. The "Great Bear Rainforest" campaign, supported by a number of environmental organizations, is seeking a change in forest management in coastal watersheds, with a focus on conserving the remaining undeveloped watersheds from development activity. Some groups are seeking a complete end to logging of old growth in the coastal temperate rainforest while others are promoting a more ecosystem-based approach to forest management. This complex and controversial issue will likely be at the forefront of discussions in an LRMP.

- These campaigns are linked to an international Market Initiative to encourage corporations to stop buying timber products harvested from coastal old growth forests. The focus of the initiative is to have companies seek eco-certification to provide assurance to consumers that the timber has been harvested using sustainable forest management practices. The campaign to demand eco-certification has placed considerable market pressure on forestry companies, some of whom have had discussions with environmental groups to try to develop short-term solutions to the current situation.

- Habitat values are very high in the valley bottoms (Pojar et al, 1999). Valley bottoms are also valuable areas for timber harvesting. Wildlife species of concern re forestry-related impacts are often dependent on the structural features of rich, low elevation areas (e.g., large trees, high levels of structural diversity). These large, old trees also have a high economic value and are most readily accessible for harvesting. Generally, both biological and economic values decline quickly outside of the valley bottoms. This creates a concentrated area of interaction where the habitat implications of timber harvesting patterns must be assessed in concert with the economic implications of changes in timber management.

- Forest harvesting changes the natural disturbance patterns in coastal forest ecosystems creating large areas of relatively young, even-aged forest in a landscape that has historically been predominantly old forest replaced by small disturbances (gap dynamics). The ecological effects of changes to natural disturbance patterns are a consideration in ecosystem-based management of coastal forests.

- Maintaining connectivity of forested cover, particularly in low elevation passes, is important in the mountainous terrain in the North Coast. Steep terrain and physical barriers such as cliffs in upland areas can pose barriers to movement of terrestrial wildlife.

- Management of forestry activities to maintain riparian function. Riparian management is currently governed by the Forest Practices Code and the *Riparian Management Area Guidebook*. Riparian features include the maintenance of water quality and quantity and natural water flow regimes and their effect on fish habitat. Fisheries and Oceans Canada has identified management of small streams as an area of particular concern.

- ☐ Management of forestry activities at they impact shoreline and nearshore habitats (intertidal and nearshore subtidal), including estuaries. This includes the impact of log dumps, log handing facilities and aquatic log storage facilities on ecological and recreational resources. Foreshore management may affect access from the water into operable areas as well as future opportunities for salvage and second rotation harvesting from the water.

- ☐ The application of silviculture activities (e.g., rotation length, harvesting method, planting and spacing) can have positive and negative affects on wildlife habitat quality. Specific silvicultural strategies may help to address the habitat requirements of species of concern during forestry operations.

- ☐ Impact of forestry activities on ungulate winter range (deer, moose, and mountain goat), e.g., reduction in forage and thermal or snow interception cover, reduced connectivity, and increased vulnerability to poaching. Consideration of goat winter habitat is particularly important for operations at higher elevations (Mountain Hemlock and upper elevation Coastal Western Hemlock subzones). Deer and moose winter ranges occur at lower elevations.

- ☐ Impact of forestry activities on rare plant communities and wildlife habitat (e.g., bat hibernacula) found in karst landscapes.

- ☐ Impact of road development on wildlife. This includes the impact of road development on habitat values and the disruption or increased vulnerability of wildlife due to increases in human access (see Section 4.10: Roaded Access).

- ☐ Forest management within scenic areas e.g., the Inside Passage.

- ☐ The use of herbicides and pesticides as silvicultural treatments.

4.3 Mineral and energy resources

4.3.1 Mineral resources

A summary of the geology of the North Coast area is provided in Appendix 2.

4.3.1.1 Metallic Mineral Deposits

Map 10 summarizes the metallic minerals potential in the plan area, based on a provincial ranking. The majority of the plan area is underlain by granitic and metamorphic rocks of the Coast Range geologic belt. However, the upper reaches of Portland Canal and Observatory inlet lie along the eastern boundary of this belt and are underlain by rocks of completely different affinity, known as the Hazelton Group rocks (see Appendix 2 for more details). As the geology and mineral deposits associated with these two rock groups are quite distinctive, they will be dealt with under separate headings.

a. Metallic Mineral Deposits In Granite and Metamorphic Rocks (Coastal Range geologic belt)

Two primary types of mineral deposits occur in areas underlain by granite and metamorphic rocks. The first type, copper-zinc-silver-gold prospects, are concentrated in the Ecstall and Dundas-Porcher belts. The second type, gold quartz veins, are associated with major faults and lineaments (see Appendix 2).

Within the **Ecstall** volcanic-sedimentary metamorphic belt, examples of copper-zinc-silver-gold prospects include the Ecstall, Packsack, Scotia, and Horsefly prospects. All occur at the same stratigraphic horizon. Similar host formations extend northwest to Prince Rupert, however, the high metallic mineral potential associated with these formations is not reflected in the metallic mineral potential map, possibly because the Ecstall mineral horizon has not yet been recognized in this area. Formations of the same age and rock type as Ecstall extend into northwest B.C. and Alaska where there are several mineral deposits, including the Tulsequah Chief deposit (southwest of Atlin) and the very silver-rich Greens Creek deposit in southeast Alaska. This correlation enhances the potential for a large copper-zinc-silver-gold deposit in the North Coast district. In 1999, the B.C. Geological Survey began a multi-year geological mapping program focused on the Ecstall belt, directed towards better recognition of mineral prospects in the belt.

The **Dundas-Porcher** belt (see Appendix 2) also contains several copper-zinc-silver-gold mineral occurrences. However, work done to date has not indicated these occurrences to be as prospective as the Ecstall belt. The best prospects found to date are the Pit and Jitney on Pitt and Porcher islands respectively. [Note: the metallic mineral potential map may be modified to better reflect our current understanding of the geology and mineralization of the area. i.e. the potential of the Dundas-Porcher belt is good, but lower than the Ecstall belt, and should include Stephens, Dunira and Dundas islands.]

Gold in quartz veins is the second significant type of metallic mineral deposit present in the granite and metamorphic rocks. Local examples of past production from this deposit type includes the Surf Point gold mine on Porcher Island, and the Surf Inlet gold mine on Princess Royal Island. The Surf Point mine operated for 3 years in the mid-1930's, whereas the Surf Inlet mine underwent several periods of operation, initially from 1902 to 1905, reopening from 1917 to 1926, and again in 1934 to 1943. Mineral deposits located to the north of the plan area provide a better appreciation of the economic potential of this deposit type. The Treadwell, Alaska-Juneau (or AJ), and Kensington gold deposits near Juneau, Alaska, are major gold deposits. Treadwell and AJ were long-lived mines that supported Juneau for 60 years. Treadwell produced gold from 1882 to 1922, and AJ from 1901 until 1943. Kensington is an undeveloped resource that languished in the Alaskan permitting process for ten years, before being abandoned.

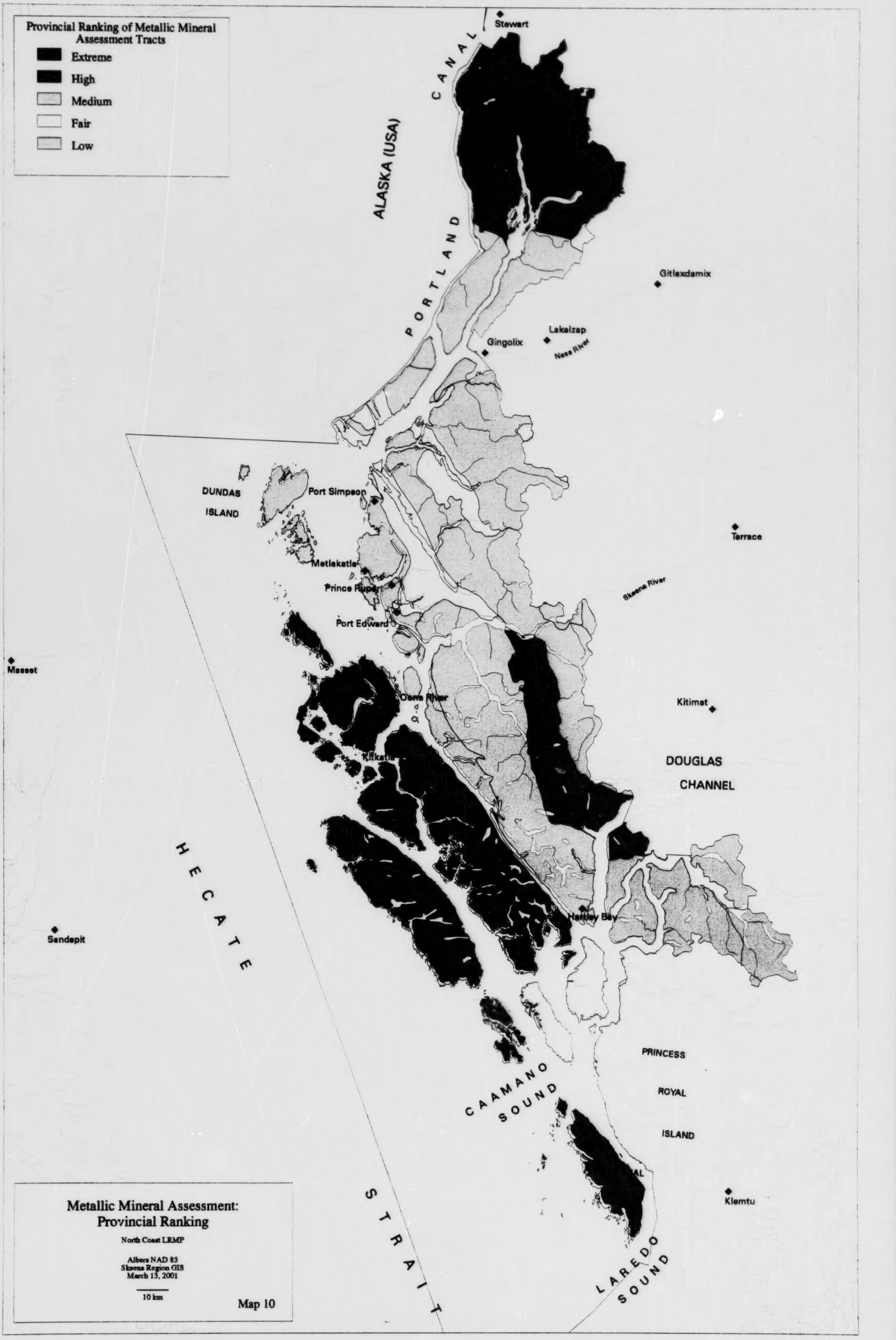
Gold-quartz vein deposits have been found on, or close to, the major faults and lineaments in the North Coast area. These structures are thought to have channeled the flow of fluid that transported the gold, with deposition of gold commonly occurring nearby in subsidiary dilational zones. The Surf Inlet and Surf Point deposits are very close to the Grenville Fault. Alaska-Juneau and Kensington are in a northern continuation of the Work Channel lineament. Yellow Giant, on Banks Island, is an undeveloped gold prospect of a different geologic type, but is grouped with the vein deposits because of its relation to a prominent northwest lineament, the Banks-Barge linear.

b. Metallic Mineral Deposits in the Anyox - Kitsault Area (Hazelton Group rocks)

The Anyox and Kitsault (Alice Arm) areas have a long history of mining, dating from the early 1900's to early 1980's. These mines extracted precious (gold and silver), base (copper, lead, zinc, molybdenum) and industrial (silica) minerals from a variety of deposits types, utilizing both underground and open pit methods. Though extensively mined, the Anyox-Kitsault area is still an excellent hunting ground for new mineral deposits. The Anyox-Kitsault area has one of the highest concentrations of mineral showings in the province and continues to be an excellent hunting ground for mineral deposits.

Within the Anyox-Kitsault area, several known mineral occurrences have the potential for future development. Undeveloped copper deposits remain at Anyox (Hidden Creek), and further reserves have been identified at the nearby Double Ed and Eden deposits. Exploration is planned in 2000, using new geophysical methods, near the main Hidden Creek ore zone. Similarly, at the former Dolly Varden and Torbrit mines, located roughly 25 km. north of Alice Arm and proximal to the Kitsault River, substantial silver, lead and zinc reserves have been outlined. Several molybdenum deposits, including the Ajax, Bell Moly and Roundy Creek prospects and the past producing Kitsault mine (closed in 1982, as a result of an over-supply of molybdenum from established U.S. mines), are located near Alice Arm. All contain molybdenum reserves that could be mined if prices warranted development.

The potential for the discovery of new deposits is high. Deposits outside of the plan area, such as the Premier gold-silver mine north of Stewart are geologically relevant to the Anyox-Kitsault area. Gold mineralization at the Red Mountain deposit, on the north edge of the Cambria Icefield, may extend under the icefield to the Homestake Ridge area at the head of the Kitsault River. The discovery of Red Mountain, in 1989, was largely due to recession of the ice field in the past few decades, exposing mineralization previously covered by ice. This ice

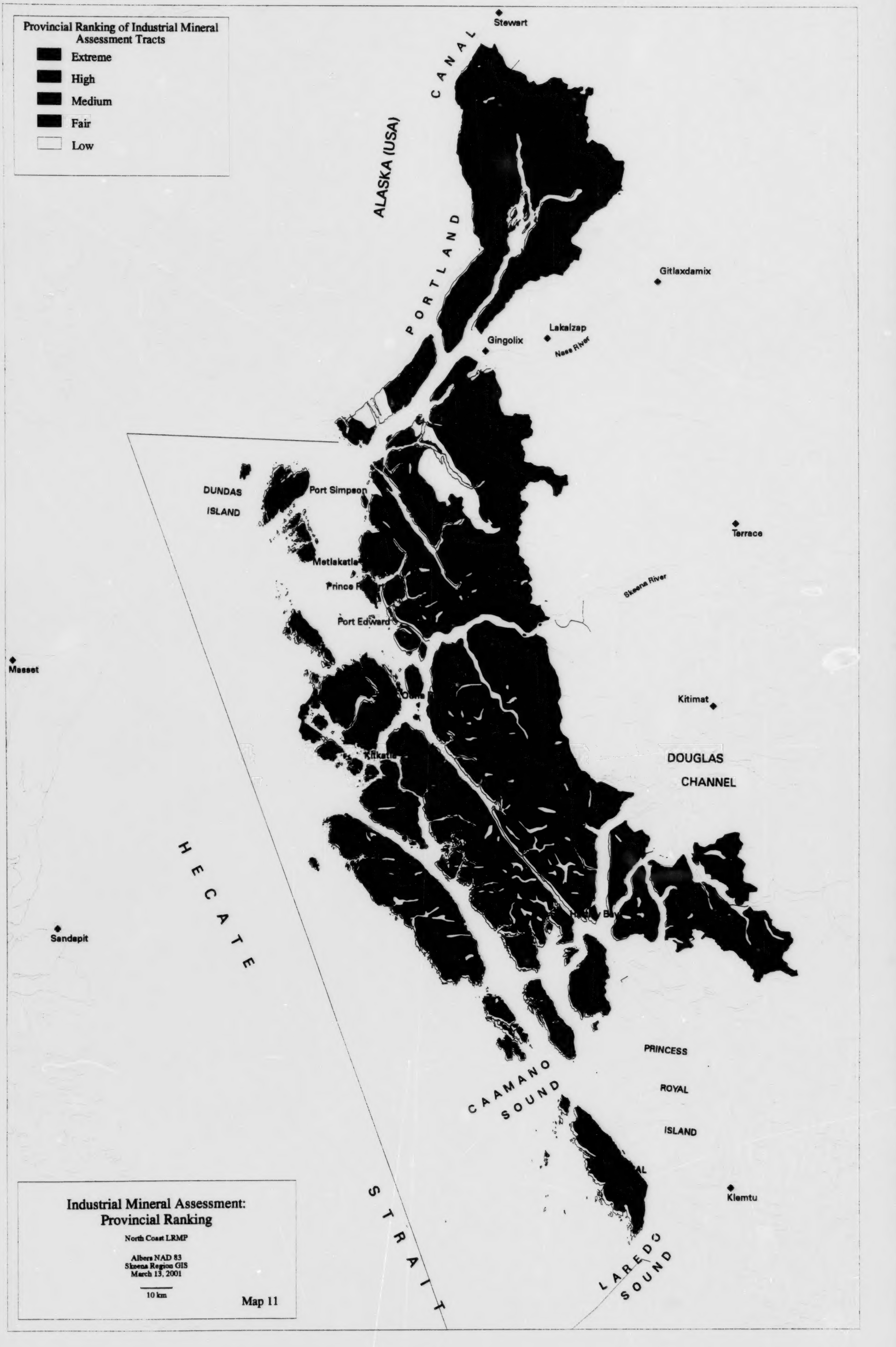


Metallic Mineral Assessment:
Provincial Ranking

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

Map 10



Provincial Ranking of Industrial Mineral Assessment Tracts

■ Extreme
■ High
■ Medium
■ Fair
□ Low

Industrial Mineral Assessment: Provincial Ranking

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

10 km

Map 11

recession has occurred since prospectors combed the Anyox-Kitsault area in the early years of this century and is a critical reason why mineral exploration will continue to be successful at discovering new deposits.

4.3.1.2 Industrial Mineral Deposits

The North Coast district has high potential for a variety of industrial minerals, gemstones and building (facing) stone (Map 11). The development of these deposits is facilitated by the advantage of low cost ocean shipping to move the product to industrial markets. The granites, metamorphic rocks and the Anyox-Alice Arm area are considered together.

In the plan area, within the belts of metamorphosed sedimentary rock, deposits of marble (metamorphosed limestone) are fairly common. Past production of these deposits, at Smith Island near Prince Rupert, Laredo on Aristazabal Island, and Swamp Point on the Portland Canal have been for industrial use. Currently, the Laredo marble deposit is being assessed for re-development of the quarry to provide high purity and "high whiteness" calcium carbonate for use as a filler in the manufacture of paint, plastics and paper. The Laredo product is a higher value product than lime used in pulp production. Dolomite, an industrial mineral closely related to limestone, occurs south of Prince Rupert but is less common than limestone or marble.

Deposits of pure silica (quartz) are found as quartzite horizons within the metamorphic belts and, with lower development potential, as quartz veins derived from granite bodies. There are several quartz prospects within the plan area, of which the most developed is located at Donaldson Creek on the east coast of Banks Island. In the Anyox-Kitsault area, several deposits were mined for quartz from 1914 to 1938, to provide flux for the smelter at Anyox. Tru-Grit Abrasives mine silica rich smelter slag at Anyox on a seasonal basis. The sized silica material is shipped to the USA for use as a sandblasting agent and the manufacture of asphalt roofing shingles.

Magnetite is used in British Columbia as a dense medium to wash coal. In southern B.C. magnetite is transported from an old mine site near Merritt for use in the Rocky Mountain coalfields. It is not unreasonable that magnetite could be transported as a CNR backhaul from Prince Rupert to the northeast coalfields. There are several magnetite deposits in the Prince Rupert area but the Skarn deposit, on central Banks Island is one of the most prospective. It is particularly interesting because it has been explored for titanium and vanadium, which are associated with the magnetite.

Garnet is a metamorphic mineral, formed in mudstone or shale that has been subjected to high temperature and pressure. Near Prince Rupert, garnet is a common mineral in schist and gneiss rocks exposed in local rock quarries. Garnet is a hard mineral, used industrially as an abrasive in sandpaper and sand blasting or, when well formed, sold as a gemstone. Garnets up to 5 cm in size, and kyanite, occur at the head of Tuck Inlet.

Kyanite and its isomorphs, sillimanite and andalusite, are pure aluminosilicate minerals that are used in ceramics. Kyanite and sillimanite deposits occur on Hawkesbury Island and various other localities, commonly associated with garnet. Large andalusite crystals, which might be gem quality, are found near the head of the Kildala River.

In addition to gem-quality garnet and andalusite mentioned above, there is potential for gem-quality sapphires within the plan area.

Building (facing) stone quarries of granite or marble have good potential for development on the North Coast. Several sites accessible from the ocean have been identified for marble, and to a lesser extent, for granite. More marble sites have been identified than granite, because of its additional potential for industrial use. Within the plan area there are numerous granite bodies that are uniform in composition and free of fractures which have yet to be assessed for building stone potential. Polished facing stone is a high value product, and the demand for this product is increasing. On Princess Royal Island (immediately south of the plan area), a resource of black granite has been identified for development.

4.3.1.3 Past Producing Mineral Mines

Historically throughout the province, underground mines accounted for the vast majority of metallic mining operations. These early underground mines focused on high-grade, metal (dominantly silver, lead and zinc) deposits. Improvements in technology in the 1960's, led to open pit mining of previously uneconomic low grade, large tonnage deposits. Since 1965, open pit mines, with their economies of scale, have produced the bulk of the minerals mined in the province.

This historical pattern of metallic mine development is evident to a limited extent in the North Coast area (Table 21). Prior to the 1960's, numerous underground metal mines were developed, but since then, only the open pit molybdenum mine at Kitsault has been in production. In the future, except for industrial mineral development (i.e. limestone/marble quarries), underground mines are more likely to be developed than open pit mines. Underground mines are favoured by the nature of most deposit types in the plan area, and because of the rugged terrain, high relief and high snowfall.

The North Coast area also has a history of industrial mineral production, a relative rarity outside of the southern portion of the province. Most of these industrial minerals were used locally, most of the silica was used at the Anyox smelter and much of the lime production was used by the Columbia Cellulose company in Prince Rupert.

Table 21. Past Producing Mines within North Coast Plan Area.

Mine Name	Location	Periods of Operation	Commodities
Esperanza	Alice Arm	1911, 1916-20, 1922-27, 1936-38, 1948	Silver, Gold, Copper, Lead
Macy	Alice Arm	1916-17, 1920	Silica
Tidewater	Alice Arm	1916	Molybdenum
Illy / Silver Bar	Alice Arm	1923	Silver, Gold, Lead
Wolf	Alice Arm	1925, 1927, 1953	Silver, Gold, Copper, Lead, Zinc
Kitsault / BC Molybdenum	Alice Arm	1967-72, 1981-82	Molybdenum
La Rose	Kitsault River	1918-19, 1926-27	Silver, Gold, Lead, Zinc
North Star	Kitsault River	1919, 1921	Silver
Dolly Varden	Kitsault River	1919-21, 1935, 1937-40	Silver, Gold, Copper, Lead
Torbrit	Kitsault River	1928-29, 1949-59	Silver, Gold, Lead, Zinc
Hidden Creek (Anyox)	Observatory Inlet	1914-36	Silver, Gold, Copper
Granby Point (Anyox)	Observatory Inlet	1916-30, 1933-38	Silver, Gold, Copper, Lead, Silica
May	Observatory Inlet	1917-22, 1924-29	Silver, Gold, Silica
Rambler	Observatory Inlet	1920-24	Silica
Bonanza	Observatory Inlet	1928-35	Silver, Gold, Copper
Goldkeish	Observatory Inlet	1928-35 (exact periods of production unknown)	Silica
Gold Leaf	Observatory Inlet	1938-39	Silver, Gold
Saddle	Hastings Arm	1929	Silver, Copper, Lead
Outsider - Star	Portland Canal	1906-07, 1924-28	Silver, Gold, Copper, Silica
Swamp Point	Portland Canal	1916-22	Limestone
Montana	Proximal to Stewart	1913, 1915, 1930	Silver, Gold, Copper, Lead, Zinc
North Fork	Proximal to Stewart	1919, 1924	Silver, Lead, Zinc
Porter - Idaho	Proximal to Stewart	1922, 1924-27, 1929-32, 1938-39, 1947, 1950, 1981	Silver, Gold, Copper, Lead, Zinc
Gold Drop	Proximal to Stewart	1936	Silver, Gold, Copper, Lead
Georgia River	Proximal to Stewart	1937	Silver, Gold, Lead
Columbia Cellulose	Smith Island	1950-52	Limestone
Jitney	Porcher Island	1917	Silver, Gold, Copper
Edye Pass Mine	Porcher Island	1919-20, 1923-24, 1926-27, 1930-31, 1934-39	Silver, Gold, Copper
Surf Point	Porcher Island	1934-37	Silver, Gold
Mica Maid	Baker Inlet	1940-41	Mica
Ox / Empress	Gribble Island	1906	Silver, Gold, Copper
Laredo Limestone	Aristazabal Island	1952	Limestone

4.3.1.4 Operating Mineral Mines

The only mineral mine currently operating in the plan area is located in Observatory Inlet at the former Anyox smelter site (Map 12). The slag pile at Anyox is smelter waste, a silica glass resulting from the process that converts copper ore to copper metal. Sixty years of weathering has devitrified this material into sharply angular coarse to fine glass splinters. The high content of impurities in the silica flux has created a slag with a hardness significantly lower than quartz. This characteristic, combined with the highly angular shape of the glass shards, makes the screened, sorted, fine abrasive ideal for sand blasting.

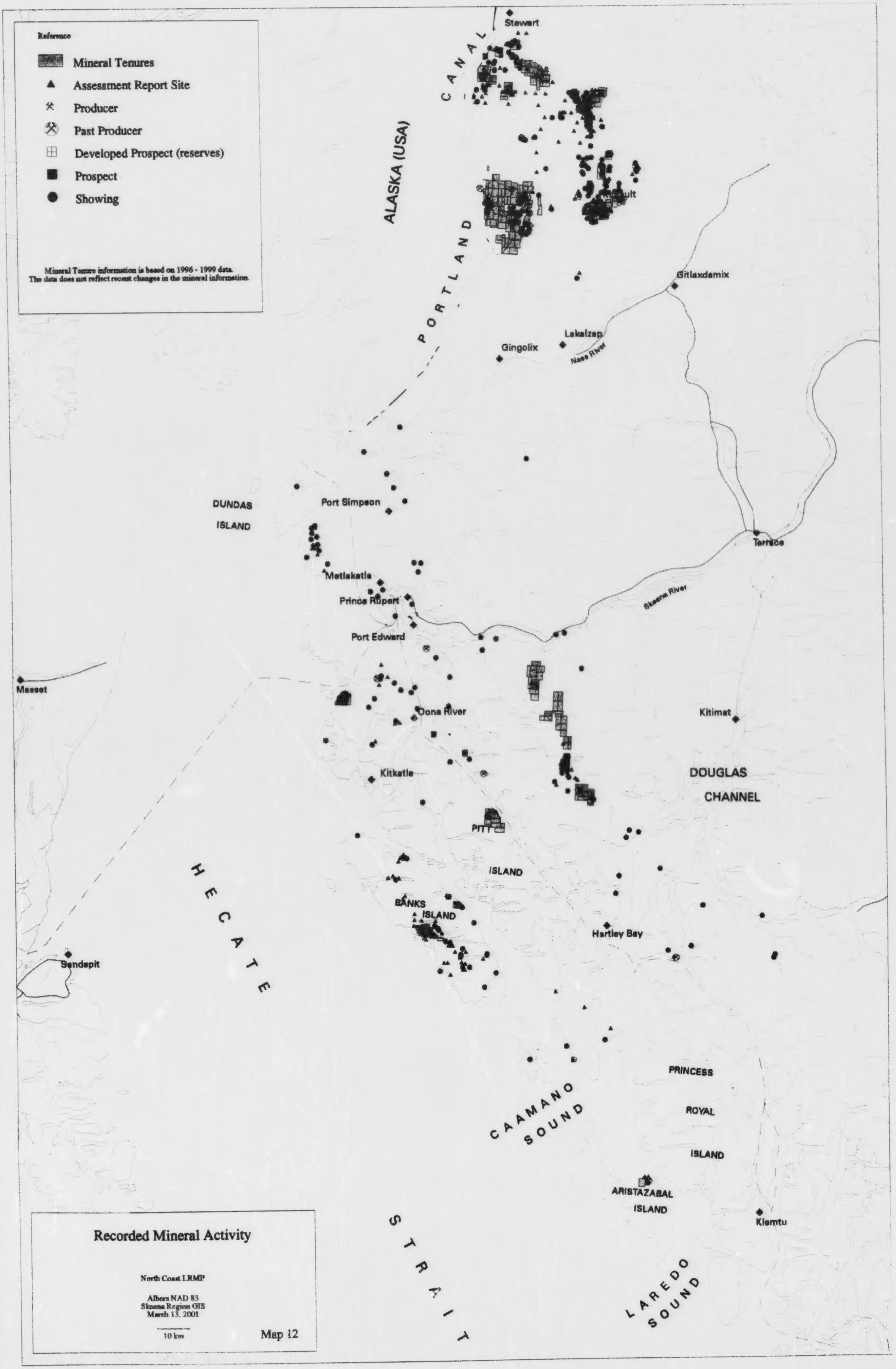
Tru-Grit Abrasives has been mining the slag pile since the mid-1980's. Initially material was removed from only the intertidal and near shore zones, with no processing facilities developed on site. In 1989, production facilities were constructed on site and mining concentrated on portions of the slag pile on shore. Reserves on site are conservatively estimated as 20 million tonnes of slag, with a probable mine life of over 50 years.

4.3.1.5 Exploration Activity

Map 12 summarizes the recorded mineral activity in the North Coast. Despite the Province-wide slump in mineral exploration, there was a significant rush to stake mineral claims during December 1999, as a result of separate geological investigations by the Geological Survey of Canada and the B.C. Geological Survey. This new information shows that the geological setting of the Anyox copper deposit is identical to the very rich Eskay Creek silver deposit. This fact and the great abundance of silver prospects nearby at Kitsault have sparked the imagination of many prospectors and exploration is expected to be active in 2000 and beyond.

The information in Table 22 lists some of the larger projects conducted in the plan area between 1994 and 1999. The list is compiled from Assessment Report records and is incomplete for two reasons. The first reason is that not all exploration work (including work with large expenditures) is recorded for assessment on mineral tenures. The second reason is that work recorded for assessment must remain confidential for one year, so the records for 1999 are likely to be incomplete.

A brief review of Table 22 indicates that mineral exploration was largely focused in the Anyox-Kitsault-Stewart area, seeking a variety of base and precious metals. The remaining metallic exploration projects were conducted in the Ecstall River area and one on Banks Island. Two industrial mineral projects with expenditures greater than $20,000.00 were also reported. In addition to the projects listed in Table 22, 32 projects with expenditures less than $20,000.00 were recorded for assessment.



Recorded Mineral Activity

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

Map 12

Table 22. Recent Mineral Exploration reporting Expenditures in excess of $20,000 for Assessment on Mineral Tenures (1994 - 1999).

Property	Location	Year	Work Program	Commodities
Clone/Red	Cambria Icefield	1998	Geological, Geochem, Geophysics, Trenching, Drilling	Gold, Copper, Cadmium, Arsenic
Clone	Cambria Icefield	1997	Geology, Geochem, Geophysics, Drilling, Grid, Trenching	Gold, Cobalt, Copper
Clone	Cambria Icefield	1996	Geochem, Trenching	Gold, Cobalt
Clone/Port	Sutton Glacier	1996	Geology, Geochem, Geophysics, Drilling, Grid, Trenching	Gold, Silver, Copper, Arsenic, Cobalt
Georgia	Georgia River	1996	Geochem, Drill, Legal Survey	Gold
Georgia	Georgia River	1995	Geology, Geochem, Geophysics, Drill, Legal Survey	Gold
Friday - Maple Bay	Portland Canal	1996	Geology, Geochem	Gold, Silver, Copper, Lead, Zinc
Ashwood	Ashwood Lake	1996	Geophysics	Gold, Silver, Copper, Lead, Zinc
Ashwood	Ashwood Lake	1994	Geology, Geochem, Geophysics, Drilling,	Gold, Silver, Copper, Lead, Zinc
CY	Kshwan River	1996	Geochem	Gold, Silver
Kitsault	Kitsault Lake	1994	Geochem	not stated
Golden Wish	Mt. Hastings	1996	Geology, Geochemical	Gold, Copper, Silver
Anyox	Anyox	1998	Geology, Geochem	Gold, Silver, Lead, Zinc, Copper
Anyox	Anyox	1994	Geochem, Geophysics, Prospecting, Grid	Copper, Zinc
Scotia/Ecstall	Ecstall/Scotia Rivers	1999	Regional geochemical silt survey	Copper, Zinc, Gold, Silver
Scotia/Ecstall	Ecstall/Scotia Rivers	1998	Geochem, Drilling	Copper, Zinc, Gold, Silver
Ecstall	Ecstall River	1995	Geology, Geochem, Grid, Trench	Copper, Zinc, Gold, Silver
Horsefly	Ecstall River	1996	Geology, Geochem, Geophysics, Drilling, Grid	Copper, Zinc, Lead
Surf Point	Porcher Island	1997	Geology, Geochem, Drilling, Reclamation	Gold
Laredo	Aristazabal Island	1994	Geochem	Limestone
Patsey Cove	Banks Island	1994	Drilling	Silica

Mineral exploration is conducted in accordance with the *Mineral Exploration Code and Mines Act of B.C.* Prior to conducting any mechanical disturbance of the land, the work program must be approved by the ministry of Energy and Mines and sufficient reclamation securities placed to ensure that the site is reclaimed. Work programs are referred to affected agencies and First Nations for comment, which is then taken into consideration when approving (or disallowing) proposed mineral exploration.

Full approval of a work program may also require that permits from other ministries be obtained. For example, where timber will be cut as part of a program, a free use permit or License to Cut is required from the Ministry of Forests. Similarly, for road construction off mineral tenures, a Special Use Permit must be obtained from the Ministry of Forests.

Programs involving use of surficial water must obtain a water use approval or water licence from the Ministry of Environment, Lands and Parks. However, where significant volumes of mineralized rock (i.e. greater than 1000 tonnes) are to be blasted as part of a sampling program, testing for acid rock drainage potential is required. Similarly, though not required by the Ministry of Forests, the Ministry of Energy and Mines will request acid rock testing where road development requires blasting of mineralized rock.

4.3.1.6 Proposed and Potential Mining Operations

Within the North Coast plan area, there are numerous mineral deposits with known reserves (Table 23, Map 12). The majority of the metallic mineral deposits are located in the north portion of the plan area, to the east of the NW trending Coast belt of metamorphic and granitic rocks underlying much of the plan area (see Appendix 2). Only five of the metallic deposits listed lie within the Coast Belt, two of that are gold deposits associated with lineaments and the remaining three are polymetallic deposits proximal to the Ecstall River. All of the industrial mineral deposits (limestone, silica, etc.) are located close to the ocean, an essential factor in the economics of developing these deposits.

One deposit, Laredo marble, is currently in the mine review process, with mine production proposed for 2001. The remaining deposits have mineral resources that are currently considered uneconomic for development. However, further success in mineral exploration, an increase in commodity prices and/or improvements in infrastructure are all factors that could bring these deposits into production.

The deposits listed in Table 23 are not intended to represent all the potential for near future mine development in the plan area. Thick tree cover, icefields, and glacial till in the plan area obscure exposures of bedrock and possible mineralization. The rugged terrain and limited infrastructure in the North Coast greatly increases costs of conducting exploration and development of ore deposits. As discussed in Appendix 2: Geology of the North Coast, the mineral potential of metamorphic rocks within the Coast belt is poorly understood. New discoveries, changes in exploration and mining technology, increased understanding of mineral deposits and/or changes in mineral prices can quite abruptly transform a minor mineral occurrence into a mine development. The inability to predict the location of future mine developments requires that flexibility be built into land use planning.

With the exception of small operations of sand and gravel, rock quarry and placer, all mine development is subject to review under either the Mining Development Review Committee or *Environment Assessment Act*. Both processes are multi-agency reviews, often involving both provincial and federal agencies as well as First Nations and the public. Major mine projects are reviewed under the *Environmental Assessment Act* and require the approval of both the Ministry of Energy and Mines and the Ministry of Environment Lands and Parks. Approval under the Mine Development Review Committee is for smaller operations and is signed off by the Minister of Energy and Mines. For a more complete description of these processes and applicable mine thresholds, please refer to the following websites:

- Ministry of Energy and Mines - Permit Application Requirements: http://www.em.gov.bc.ca/Mining/MinePer/permreq.htm.
- Environmental Assessment Office: http://www.eao.gov.bc.ca

Table 23. Developed Mineral Prospects in North Coast plan area.

Name	Minfile #	Location	Commodities
Laredo	103A 001	Aristazabal Island	Lime
Quartz Dome	103H 041	Campania Island	Silica
Yellow Giant	103G 025	Banks Island	Gold
Donaldson	103G 022	Banks Island	Silica
Kumealon Limestone	103H 073	Kumealon Inlet	Lime
Packsack	103H 013	Upper Ecstall River	Copper, Zinc, Lead, Gold, Silver
Ecstall	103H 011	Upper Ecstall River	Copper, Zinc, Gold, Silver
Scotia	103I 007	East of Ecstall River	Copper, Zinc, Lead, Gold, Silver
Redwing	103P 024	Observatory Inlet (Anyox)	Copper, Zinc, Gold, Silver
Double Ed	103P 025	Observatory Inlet (Anyox)	Copper, Zinc
Eden	103P 026	Observatory Inlet (Anyox)	Copper, Zinc
Bonanza	103P 023	Observatory Inlet (Anyox)	Copper, Silver, Gold
Hidden Creek (Anyox)	103P 021	Observatory Inlet (Anyox)	Copper, Silver, Gold
Surf Point	103J 017	Porcher Island	Gold
Roundy Creek	103P 113	Alice Arm	Molybdenum
Bell Moly	103P 234	Alice Arm	Molybdenum
Tidewater	103P 111	Alice Arm	Molybdenum
Kitsault	103P 120	Alice Arm	Molybdenum
Ajax	103P 223	NE of Alice Arm	Molybdenum
Wolf	103P 198	Kitsault River	Silver, Zinc, Lead
Moose	103P 205	Kitsault River	Silver, lesser Zinc + Lead
Victory / Last Chance	103P 206	Kitsault River	Silver
Vanguard	103P 210	Kitsault River	Copper, Silver, Gold
Torbrit	103P 191	Kitsault River	Silver, Lead, Zinc
Dolly Varden	103P 188	Kitsault River	Silver
North Star	103P 189	Kitsault River	Silver
Princess	103P 048	Portland Canal (Maple Bay)	Copper, minor Gold + Silver
Eagle	103P 043	Portland Canal (Maple Bay)	Copper
Outsider	103O 018	Portland Canal (Maple Bay)	Copper
Georgia River	103O 013	Proximal to Stewart	Gold, Silver
Porter-Idaho	103P 089	Proximal to Stewart	Silver, Lead, Zinc

4.3.2 Construction aggregate resources

The mining of construction aggregate is regulated under the *Mines Act*, however the resource is not considered a "mineral" under the *Mineral Tenure Act*. As such, the Ministry of Energy and Mines does not administer the tenure nor collect revenues for these resources. On Crown land, these tenures are administered and royalties are collected by B.C. Assets and Lands Corp. On private land, no tenure (other than that of property ownership) is required.

Mining conducted by the private sector, individuals, local government and the Ministry of Transportation and Highways is regulated by the Ministry of Energy and Mines. Pits and quarries developed for forestry purposes are currently regulated by the Ministry of Forests. Similarly all construction aggregate tenures on Crown land , with the exception of those for forestry purposes, are administered by B.C. Assets and Lands Corp.

Construction Aggregate pits and quarries

The majority of aggregate pits and rock quarries in the plan area are Ministry of Forests or Ministry of Transportation and Highways reserves and are operated by contractors working on Ministry projects and infrastructure. Throughout the northwest region, aggregate and rock production from private and municipal reserves is minor compared to that of the provincial government. In the plan area, this situation is further exacerbated by the lack of naturally occurring aggregate resources.

There are minimal gravel resources in the plan area, particularly near the coast. Only one private aggregate pit has been developed, near Port Edward, but the aggregate produced is of a lower quality and used mostly for fill (see Appendix 2). The bulk of aggregate products (washed/sorted gravel, cement aggregate) are trucked from Terrace, greatly increasing the cost to the consumer. A 1997 survey of communities throughout British Columbia, found the cost of aggregate in Prince Rupert to be the highest in the province, almost double the cost of aggregate in other northwest B.C. communities located proximal to Highway 16.

On the coast, rock is used extensively for fill. The airport facility is built on rock taken from waste dumps at the former Tasu Mine. The production of crushed rock is relatively expensive and only two rock quarries have been developed in the plan area. One is privately owned and located near Ridley Island, the other is operated the city of Prince Rupert near Seal Cove.

No detailed assessment of aggregate resources has been conducted in northwestern B.C. and it is unlikely that funds will be available in the near future to complete such an assessment.

4.3.3 Oil and gas potential

The combined presence of reservoir strata, source rocks, trapping mechanisms and the common occurrence of oil and gas shows reflect significant potential for petroleum accumulations within the Queen Charlotte Basin. One of the prospective areas is Hecate Strait, a small portion of which lies within the North Coast plan area.

A report published by the Geological Survey of Canada in 1998, estimates that the Queen Charlotte Basin, which includes most of Hecate Strait, could hold an estimated 9.8 billion barrels of oil and 25.9 trillion cubic feet of gas (GSC, 1998). Compared to the ultimate hydrocarbon potential of northeast B.C., the Queen Charlotte Basin may contain 10 times as much oil and about one third as much gas. The Jeanne D'Arc Basin, off the east coast of Newfoundland (which includes the Hibernia field) is estimated to contain about 4.7 billion barrels of oil and 13 trillion cubic feet of gas. Geologically the Queen Charlotte Basin has been likened to the prolific oil producing Cook Inlet Basin of Alaska.

Drilling to test for oil and gas potential in the Queen Charlotte Basin was initially conducted on Graham Island in 1913, with 8 more wells drilled onshore between 1949 and 1971. Between 1966 and 1968, Shell Canada Ltd. conducted several thousand line-kilometres of marine seismic reflection and drilled eight wells offshore, including 6 wells in Hecate Strait. In 1971, additional marine seismic work was conducted by Chevron Canada Ltd. Exploration conducted since 1972 has been minimal. One well was drilled onshore on Graham Island in 1984 by Bow Valley Industries, and in 1988, the Geological Survey of Canada completed 1,000 km of marine reflection data and carried out a seismic refraction survey.

Exploration in the Queen Charlotte Basin has been limited to a large extent by jurisdictional battles between the Federal and Provincial governments. The Provincial government has had a moratorium on oil and gas exploration since at least 1959. This moratorium was not imposed in response to environmental concerns, rather it was the Province's way of attempting to establish jurisdiction over the waters. At the federal level, decisions as to whether offshore exploration would be allowed were granted on a year-by-year basis from 1972 until 1989, allowing for the limited exploration described above. In 1972, in response to environmental concerns, the Federal government imposed a moratorium on the transit of crude oil tankers through Dixon Entrance, Hecate Strait and Queen Charlotte Sound[22]. Offshore oil and gas exploration was included in this moratorium.

In 1981, the Province of B.C. again declared the Inland Marine Zone as provincial territory, stating that no oil and gas exploration could take place without a full environmental review. That federal-provincial review was held from 1984 to 1986, with the panel agreeing that exploration could proceed, with a number of conditions. In 1989, following the Exxon Valdez spill, the province indicated there would be no drilling for 5 years. Subsequently, a Federal Order-in-Council was put in place prohibiting offshore drilling.

In 1997, the Prince Rupert and District Chamber of Commerce formed a North Coast Oil and Gas Task Force to develop a case for lifting the moratorium and has actively been lobbying for a resumption of oil and gas exploration on the B.C. Coast. That position has been supported by municipal leaders of many northern coastal towns. However, conservation interests remain strongly opposed to lifting the moratorium.

Within the LRMP landbase there is negligible potential for oil and gas development. A small pocket of moderate gas potential (20,001 - 40,000 m^3) has been identified in the vicinity of Alice Arm (Map 13).

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[22] Tankers continue to go down the outer coast of B.C. from Valdez, Alaska.

4.3.4 Geothermal potential

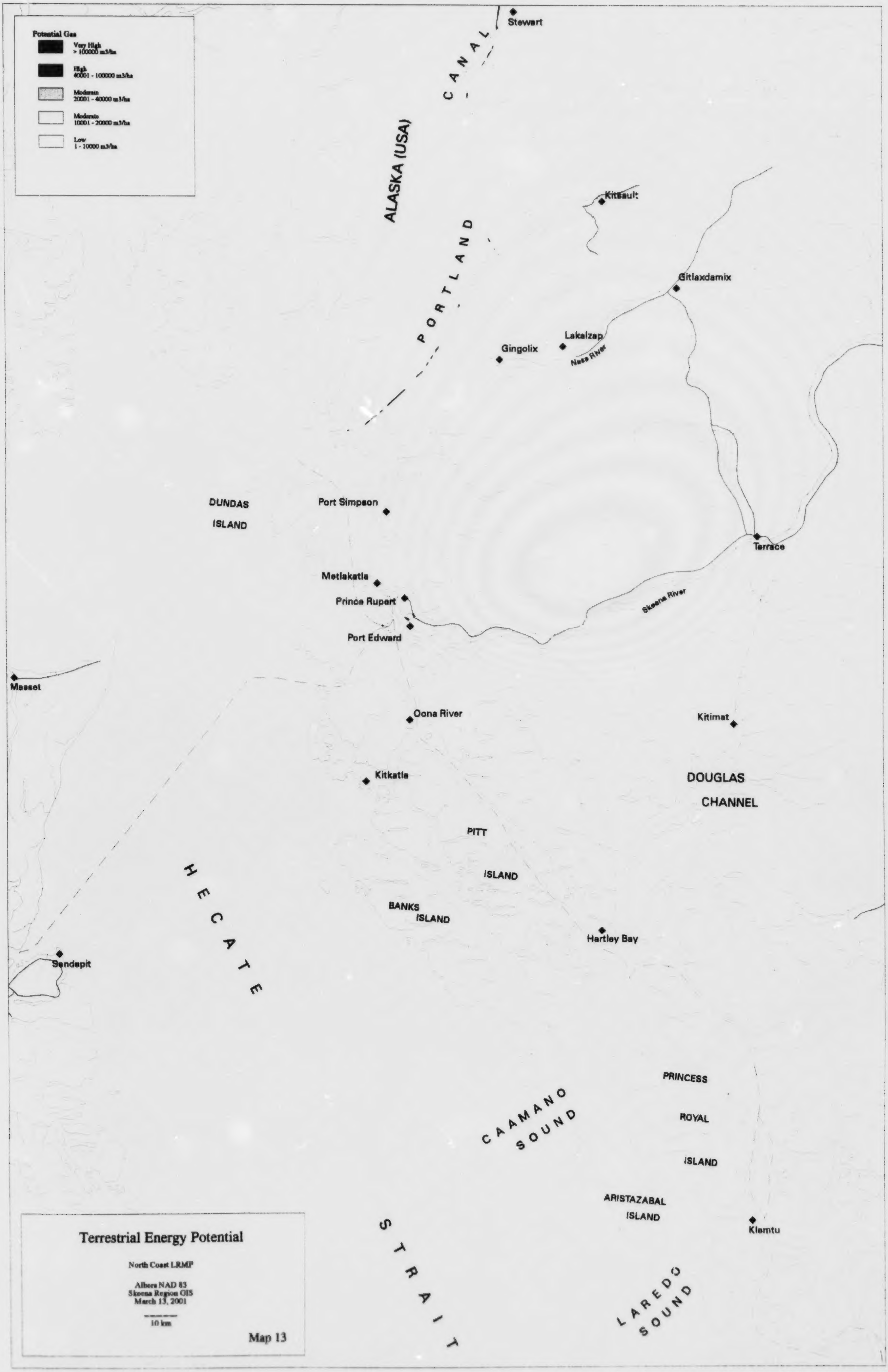
Geothermal energy is used in two ways. At high temperatures, natural steam or hot water is used to produce electricity. At low temperatures, warm water may be used for space heating and other near site applications. Only a small percentage of geothermal energy sources are suitable for electricity generation, with the majority of the resource being best suited for space heating and recreation. 'High grade' resources are all those which could be used for electricity generation. The B.C. Geothermal Resources Act defines a geothermal resource as a geothermal fluid having a temperature in excess of 80°C at surface.

There is moderate to high geothermal potential throughout the mainland of the plan area. The geothermal pockets in the plan area have recorded surface temperatures ranging from 44°C to 85°C and may reach temperatures of up to 200°C at depth, generally increasing 25 – 30°C with each 1000m of depth. The geothermal energy in most of the plan area is sufficient to be harnessed for use in direct heating (up to 100°C). Around Douglas Channel and Gardner Canal and in the Lower Skeena River there may be sufficient heat in the geothermal pockets (100°C – 200°C) for indirect conversion to electricity.

There are a number of thermal springs in the plan area along the Skeena River and to the south in the vicinity of Douglas Channel. Some of these springs are popular recreational destinations, including Shearwater Hotsprings along Gardner Canal, Bishop Bay Hotsprings in Ursula Channel, and Weewanie Hotsprings just outside of the plan area in Devastation Channel (see Section 4.4: Recreation and Tourism).

4.3.5 Strategic planning issues related to energy and mineral resources

- Completion of an LRMP for the North Coast would help to provide certainty to the mining sector regarding lands available for mineral exploration and development.
- Identification of key resource values that need to be considered in environmental assessment review processes.
- Timing of mineral exploration activity in areas of critical wildlife use.
- Any negotiation of shoreline zones should consider potential impacts on mineral and energy development, both on the coast and further inland.
- The government is in the initial stages of consultation regarding the possible lifting of the current moratorium on offshore oil and gas exploration and development. Offshore or marine oil and gas development is not a land allocation issue under the mandate of the LRMP. Consideration of issues related to land-based oil and gas exploration and development is within the mandate of the LRMP table.



Terrestrial Energy Potential

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 13, 2001

Map 13

4.4 Recreation, Tourism and Visual Quality

With its spectacular scenery, rich cultural history, and diversity of landforms, the North Coast LRMP has an abundance of opportunities for high value recreation and tourism for local residents and as a destination and gateway for people from throughout British Columbia and around the world. Prince Rupert is a port of call for ferries to Alaska, Vancouver Island and the Queen Charlotte Islands/Haida Gwaii. A number of cruise ships travel through the district but few currently stop at Prince Rupert. The scenic beauty of the Inside Passage and surrounding coastal areas is recognized internationally. The Yellowhead Highway and VIA Rail provide land-based routes through memorable coastal vistas to Prince Rupert, linking with destinations beyond.

Complex marine channels and numerous small islands, bays and peninsulas provide an extensive network of relatively protected coastal waterways. The LRMP area has some of the deepest fjords in the world, including Douglas Channel, Portland Canal, and Observatory Inlet, which provide safe anchorages amidst spectacular scenery. Water-based recreational activities such as cruising, sailing, ocean kayaking, and scuba diving are plentiful and increasing in popularity. The area includes some of the finest salmon fishing rivers in the province and there are opportunities for exceptional freshwater and marine fishing. There are also numerous lakes that provide excellent trout fishing opportunities. The North Coast is an internationally recognized staging area for sports fishing, both self-directed and guided.

The rich and ancient culture of the local First Nations and a vibrant pioneer history provide numerous tourism attractions, adding to the character and appeal of the area. There are also a number of opportunities for land-based activities such as hiking, camping, hunting and wildlife viewing.

4.4.1 Recreation activities and areas of use

Most of the recreation in the plan area is water-based. There are opportunities for landbased activities such as hiking, camping, and hunting, but these are limited by the small number of accessible roads. A map of recreation features is under development and may be added to later versions of this report.

There are relatively few developed recreational sites, although there are many areas throughout the coast that are used recreationally.

Parks and recreation sites

Parks

Provincial parks

There are eleven provincial parks and ecological reserves in the plan area (Map 3). Five of these parks have been established primarily for recreational use (see Section 5.0: Protected Areas).

Two small parks are located off Highway 16 just outside of Prince Rupert. Diana Lake Park is a day use facility that includes picnic sites and hiking trails (2.5 kilometre Diana Creek trail). Prudhomme Lake Park has 18 24 RV/tent sites. Both parks provide opportunities for fishing, boating and swimming.

There are three parks along Grenville Channel : Union Passage, Lowe Inlet, and Klewnuggit Inlet Marine Parks. These parks provide protected anchorages for boaters. The Khutzeymateen Grizzly Bear Sanctuary is a park that provides outstanding wildlife viewing opportunities. While promotion of the park for grizzly viewing is not promoted, the sanctuary has become a destination for tourists and recreationists, who can witness grizzlies feeding from the safety of their boats. This park is managed in the spirit of cooperation, respect and friendship between BC Parks and the Stewardship of the Gitsi'is Tribe. The park is also managed in a manner that recognizes the conservation of grizzly bears as the highest priority, and in a manner consistent with the maintenance of the traditional territories, the protection of historic cultural sites, and the exercise of any aboriginal rights by the Stewardship of the Gitsi'is Tribe. The only access to the park is by water and visitors are not permitted on to land without a permit.

Table 24 shows the visitation numbers for Diana Lake and Prudhomme Lake Parks over the past ten years. The number of users at Diana Lake has dropped considerably over the past 10 years, while the use of Prudhomme Lake park has remained relatively constant. There are currently no numbers available for use of the marine parks or visits to the Khutzeymateen Park.

Table 24. Visitation at provincial parks in the North Coast

Park	**Visitation**		
	1990	**1994**	**1999**
Diana Lake (day use)	10,386	7669	5078
Prudhomme Lake (day use)	6740	8306	5637
Prudhomme Lake (campground)	1424	1596	1328

Source: BC Parks, 2000

4.4.1.1 Municipal parks

Oliver Lake Park is a municipal park 6 km outside of Prince Rupert. A boardwalk trail traverses the natural dwarf muskeg forest.

4.4.1.2 Recreation sites and trails

The Ministry of Forests maintains three recreation sites and two recreation trails in the plan area. These are described in Table 25. The recreation site at Bishop Bay Hotsprings is heavily used and may have reached the limits of its carrying capacity.

Table 25. Recreation sites and trails in the North Coast plan area.

Recreation facility	Location	Facilities	Comments
1. Lach Mach Campsite	South end of Work Channel, off Highway 16	Roadside campsites Primitive boat launch	4WD required in rainy conditions
2. Welcome Harbour	Outer coast of Porcher Island	Two mooring buoys Small campsite	Prince Rupert Yacht and Rowing Club shares site maintenance
3. Bishop Bay Hotsprings	Ursula Channel near Gribbell Island	Boat dock and two buoys Developed hot pool Roofed picnic area Camping area	Heavily used site
4. Mount Oldfield Trail	15 minutes from Prince Rupert	6 hour return hike to the top of Mt Oldfield and Mt Hays Views of Prince Rupert harbour and Queen Charlotte Islands/Haida Gwaii	Moderately difficult hike
5. Butze Rapids Trail	15 minutes from Prince Rupert	2 hour return hike to view Butze Rapids.	Interpretive hike Best view is on the "falling tide"

There is also a Forest Service recreation site at Weewanie Hotsprings in the Kalum Forest District in Devastation Channel north of Gardner Canal.

4.4.1.3 Other recreational features (land-based)

4.4.1.4 Hiking Trails

The City of Prince Rupert maintains a 5 km trail off Highway 16 to Grassy Bay (opposite the Mount Oldfield Trail). The trail passes by a viewing point where one can observe the "reversing rapids" that occur during the change of tide. The trail ends at a flat beach.

There are a number of trails that are not maintained. All of these trails are accessed off Highway 16. These include:

- Rainbow Lake Trails – around Rainbow Lake and the Rainbow Summit.
- Trail up the back of Mount Hays from the access road between Ridley and Kaien Islands.
- Old growth trail off of the Butze Rapids trail.

4.4.1.5 Other recreational features (water-based)

Marine anchorages

As previously mentioned, much of the recreational activity in the North Coast is water-based. Table 26 lists some of the secure anchorages in the North Coast. These areas provide suitable shelter, depth and bottom conditions to be reliable stopping places for pleasure boats (motorized and sail) and kayakers. They may or may not have moorage buoys or campsites.

Many of the anchorages listed in Table 26 are on the provincial boat haven list, prepared by the Council of BC Yacht Clubs. The list provides specific locations of anchorages all along the coast and on Vancouver Island and the Queen Charlotte Islands/Haida Gwaii and indicates their relative value for boaters.

Table 26. Marine anchorages in the North Coast.

Anchorage	Provincial Boat Haven list	Location	Features
Bishop Bay Hotsprings	√	Ursula Channel	Forest Service Recreation Site, developed hotpools
Brundige Inlet	√	Dundas Island	Excellent protection from all weather
Captain Cove	√	W side of Pitt Island	Popular site
Coghlan Anchorage	√	SW of Hartley Bay	Harbour of refuge
Colby Bay	√	Banks Island	Well protected waypoint
Crow Lagoon		Outer end of Khutzeymateen Inlet	
Curtis Inlet	√	Pitt Island	Harbour of refuge and desirable waypoint
Devlin Bay	√	Prior Island	Harbour of refuge
Ethelda Bay	√	W side of the Estavan Group	Harbour of refuge and desirable waypoint
Fords Cove		Portland Canal	Recreational fishing camp
Hartley Bay		End of Douglas Channel	Community of Hartley Bay
Hawk Bay	√	Fin Island	Harbour of refuge and destination waypoint
Ire Inlet	√	Anger Island (off Pitt I)	Protected anchorage and desirable waypoint
Kelp Passage Anchorage	√	Porcher Island	Harbour of refuge and critical destination waypoint
Kitsaway Anchorage	√	W of Kitsaway Island	Protected anchorage
Klewnuggit Inlet	√	Grenville Channel	Well protected. Very beautiful

Anchorage	Provincial Boat Haven list	Location	Features
Kumealon Island Anchorages	√	Grenville Channel	Desirable waypoints with beach access and fresh water
Legace Bay	√	Work Channel	Harbour of refuge
Loretta Island Cove	√		Protected anchorage and destination waypoint
Lowe Inlet	√	Grenville Channel	Marine Park Highly desirable anchorage in scenic area. Falls and freshwater lakes nearby
Maple Bay		Portland Canal	No facilities
Newcombe Harbour	√	W side of Pitt Island	
Spicer Island Anchorage	√		Very safe anchorage and highly desirable waypoint
Winter Inlet	√	Pearse Island	Harbour of refuge
Welcome Harbour		Porcher Island	Forest Service recreation site. Mooring buoys maintained by Pr Rupert Yacht and Rowing Club
Weinberg Inlet	√	Campania Island	Harbour of refuge and desirable waypoint
Zumtela Bay	√	Tsimpsean Peninsula	Harbour of refuge

Kayaking and small boat destinations

Much of the paddling in the North Coast is based out of Prince Rupert. There are a number of potential multi-day trips for kayakers and small boat users out of Prince Rupert. The following destinations are described in *Kayak Routes of the Pacific Northwest Coast* (1998). Local tour operators offer guided trips to these islands.

- Porcher Island – Welcome Harbour, Oval Bay, Cape George
- Stephens Island and the Tree Nobs – Skiakle Bay, China Islet
- Lucy Island – small island with campsite midway to Melville Island. Lucy Island has a large bird colony that nests in burrows (rhinoceros auklets). Access restrictions may be required to protect nests from being damaged or destroyed by hikers when the birds are nesting.
- Melville Island and Dunira Island – several campsites on small islands
- Dundas Island – sheltered tidal narrows at the southwest and west side of island
- Anger Island - west side of Pitt Island, many small islands and inlets, coves and bays to explore.

The B.C. Marine Trail Association was formed to establish a marine trail system with camping and resting areas for kayakers and small boat users all along the B.C. Coast. The Association is a good source of information on travel routes and camping areas for ocean travelers.

4.4.1.6 Other places of interest

- ☐ Shearwater Hotsprings in Gardner Canal. Undeveloped site with a hotpool and mooring buoy.

4.4.2 Tourism

Tourism is a growing industry in the North Coast. Some of the key strengths of tourism development in the North Coast include the natural scenery, opportunities for outdoor recreation, cultural and heritage attractions, and the location of the plan area at the crossroads of major travel routes to Alaska, the Queen Charlotte Islands/Haida Gwaii, Vancouver Island, and the Interior of B.C. and the Yukon (Province of BC, 1998).

The City of Prince Rupert Economic Development Strategy identifies the following as key tourism opportunities in the area:

- ☐ Boat/fishing charters
- ☐ Sports fishing lodges
- ☐ Eco-tours (kayaking, canoeing, sailing, diving)
- ☐ Cruise ship traffic
- ☐ Whale watching and other wildlife viewing
- ☐ Heritage and culture
- ☐ Tourism tied to the waterfront
- ☐ Flightseeing

Many of the existing tourism operations and the focus for future tourism development are centred on the coastal marine environment and cultural heritage values that give the North Coast its unique character.

Some of the challenges to tourism in the region, as identified in a 1990 tourism task force include: the need for increased tourism infrastructure; need for improved information and marketing; social and cultural challenges, including social impacts related to increased tourism traffic; the seasonal nature of tourism operations; and the limitations of the available labour force (Yates, Parkin Communications, 1990).

A comprehensive North Coast Tourism Opportunity Study (TOS) was completed in March 2001 that assesses the tourism potential in the North Coast Forest District. Part of a province-wide initiative by the Ministry of Small Business, Tourism and Culture (MSBTC), the purpose of the TOS is a to compile information that can be used by communities and entrepreneurs as a tool for furthering tourism development. The products of the TOS: provide a 'snapshot' of the area's current tourism industry; analyze the kinds of tourism activities that could be conducted in areas that may not be currently undertaken by tourism operations; assess the strengths and weaknesses facing the development of designated tourism products in the area; and provide an overview of the best opportunities for development for each of the designated communities within the study area.

The North Coast Tourism Opportunity Study identified 140 tourism operators, broken down as follows:

- ☐ Accomodation only: 30
- ☐ Accomodation and Touring Services (including 26 charter boats): 43
- ☐ Touring/Other Experiences only (primarily fishing charters): 36
- ☐ Scheduled Transportation Services/Tours: 5
- ☐ Scheduled Transportation only: 9
- ☐ Museum/Art Attractions: 8
- ☐ Other (includes 7 marinas): 9

These operations are shown on Map 14 (Existing Tourism Use Areas), which is one of the outputs of the TOS. Not all operations are identifiable at this scale of mapping due to the fact that many are "clustered" in specific areas such as Prince Rupert. The map also shows broader areas of tourism use as identified by operators during the TOS consultation process.

4.4.2.1 Touring

Touring accounts for a significant amount of the tourism activity in the plan area (Province of BC, 1998). Many visitors embark or disembark from ferries traveling to or from Vancouver Island, the Queen Charlotte Islands/Haida Gwaii, Alaska or Bellingham. Many travelers are en route to Alaska. Others are doing the "circle route," travelling overland through the Interior of B.C. and then taking the ferry to their next destination.

In 1995, a total of 187,237 passengers embarked or disembarked from ferries in Prince Rupert (Province of BC, 1998). In the 1980s, over 20,000 cruise ship passengers visited Prince Rupert annually. The number dropped to a few hundred in the mid-1990s (Province of BC, 1998). In 1999, Norwegian Cruise Lines made a test-call, bringing 2700 additional visitors (1800 passengers and 900 staff) to the city (Ferguson, pers. comm.). In recent years, the Prince Rupert Port Corporation has been developing the harbour to attract cruise ships, catering in particular to "pocket cruisers" which carry between 25 and 500 passengers. To this end, the Corporation is completing a new docking facility for small cruise ships in the historic Cow Bay area, which has been rejuvenated in recent years to cater to the tourism market (Mrozewski, 1998).

VIA Rail is also gearing its marketing strategies to promote its northwest route to tourists. Promotional materials describe travel on "The Skeena" from Jasper to Prince Rupert as a "magnificent Rocky Mountain train adventure" to "the Pacific northwest and fjord country."

Visitors traveling through the North Coast have high expectations of scenic quality along their travel route. For this reason, the North Coast Forest District has established scenic area zones along major travel corridors (see Section 4.4.3: Visual quality)

4.4.2.2 Recreational fishing

The waterways of the North Coast provide exceptional angling opportunities, in the ocean as well as lakes, rivers and streams. Sport fishers may be guided or fish independently (see Section 4.6: Fishing).

Outstanding marine fishing opportunities make the North Coast a destination for fishermen from around the world. There are currently 80 licensed fishing charter businesses in Prince Rupert (Prince Rupert Visitor Information Centre, 2000). These operations range from fully catered luxury cruisers to small side businesses on personal craft. Lodges offer multi-day packages that include accommodation, gear and guides. Supporting businesses offer supplies and fish processing facilities.

Good ocean sport fishing is available most months of the year, although the best times for fishing are from late April to late September. The most sought after species for sport fishers include salmon (particularly chinook and coho), halibut, and a variety of rockfish (e.g., red snapper and ling cod). Other species fished include sockeye, pink and chum salmon. In 1999, the coho fishery was closed throughout the plan area, with the exception of Portland Inlet, due to low numbers of fish returning to spawn.

Another popular pastime is to trap for crabs and prawns. Local charter operations also offer non-fishing excursions such as beachcombing, scuba diving and whale watching.

There are numerous lakes, rivers and streams in the area that provide excellent freshwater fishing. Most of the freshwater sport fishing is concentrated on the Skeena River, although the Nass River is also popular (See S 4.5: Fishing). Steelhead and trout are the main catches in freshwater systems as well as cutthroat trout, Dolly Varden trout and the various species of salmon. There are numerous fishing lodges throughout the area.

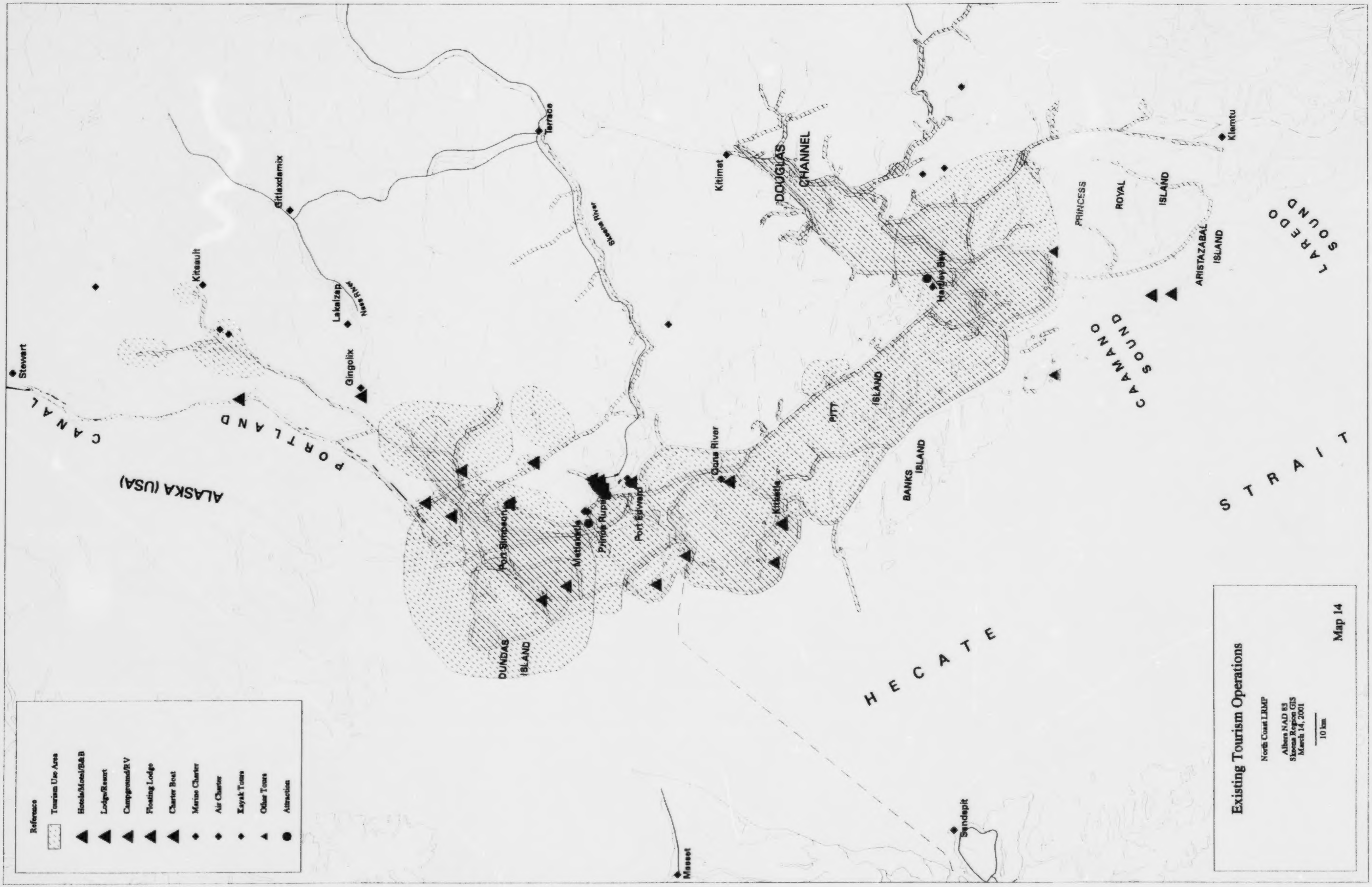
4.4.2.3 Ocean-based tourism

The protected bays and inlets of the coastline offer numerous opportunities for kayaking, canoeing, sailing, motorized boating and diving, either as independent travel or as guided tours or charters (see Section 4.4.1: Recreational Activities and Areas of Use). There are a number of local businesses offering kayak tours and rentals, sailboat and motorboat charters and dive charters. These include charters to areas of interest such as the Khutzeymateen Grizzly Bear Sanctuary, historic and cultural heritage sites, and hotsprings.

High scenic quality and opportunities for remote wilderness experiences are an important part of the product of these ocean-based tourism operations.

Adventure tourism

Eco-tourism and adventure travel are some of the fastest-growing segments of the tourism industry. To prepare a skilled workforce to cater to increases in the adventure tourism market, Northwest Community College offers a certificate program in Coastal Eco-Adventure Tourism. Students are taught skills in handling various watercraft as well as mechanical and rescue skills, risk management and coastal heritage interpretation, and environmental stewardship.



Existing Tourism Operations

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

Map 14

4.4.2.4 Cultural Heritage Attractions

The North Coast has a strong heritage, both in terms of First Nations culture and non-aboriginal history. This heritage is considered a prime tourism asset with high potential for increased tourism development in the future (Mrozewski, 1998; PREDC, 1998). First Nations cultural heritage sites include petroglyphs, pictographs, ancient village sites and fish dams. There are numerous remnants of the early European settlers and past industries.

There are currently a number of tourism operations that are built around cultural heritage resources. The Museum of Northern British Columbia conducts harbour tours in the summer, called "A Sail through Time." The tours include a stop at Metlakatla Village to visit cultural heritage sites. The tours also stop at historic non-aboriginal sites such as the Finnish village of Dodge Cove on Digby Island. Metlakatla is involved in a co-venture to conduct archaeology tours out of Prince Rupert to Pike Island (Laxspa'aws), a Metlakatla reserve in Venn Passage. Tour participants are led on an instructive excursion to three ancient village sites and areas with petroglyphs. A number of boat and kayak charters include cultural heritage interpretation as part of their packages.

4.4.2.5 Guide Outfitting

There are portions of three guide-outfitting territories in the LRMP, comprising approximately half of the plan area. The remaining half is non-guided. Guided outfitters lead clients on hunts for grizzly and black bears, moose and mountain goat (see Section 4.7.2: Guide Outfitting).

4.4.3 Visual quality

There are four scenic area zones in the North Coast TSA as identified by the Ministry of Forests. These are summarized in Table 27. The zones are based on visible areas along four major transportation corridors, including Highway 16 and highly used travel corridors for ferries and cruise ships. Visual landscape inventories identifying and mapping other significant visible areas have yet to be completed. These include the Ecstall River, Khtada Lake, and some of the outer coast islands. Western Forest Products has completed a visual landscape inventory of portions of TFL 25 within the plan area. A summary map of the available visual landscape inventories for the North Coast will be completed in 2001.

The District Manager of North Coast Forest District has made the scenic area zones "known" under the Forest Practices Code. As "known" scenic areas, all forest development within the zones, including timber harvesting and roads, must be planned and managed to minimize visual impacts. Integrated resource management is currently applied to all areas outside of the scenic area zones. Approximately 30% of the timber harvesting landbase in the North Coast TSA is subject to visual quality management. (MOF, 1999), ranging from "preservation" to " modification" Visual Quality Objective (VQO) zones as described in Table 27.

At this time, VQOs have been recommended for the scenic area zones but have not been formally established under the Forest Practices Code. Therefore, although the Ministry of Forests is managing to the standards noted in Table 27, these VQOs are not at this time legally binding under the Forest Practices Code. The forest district currently requires visual simulation packages of all forest operations within the known scenic area zones.

Table 27. Visual quality objectives for scenic area zones in the North Coast LRMP.

Scenic Area Zones (as identified by the Ministry of Forests)	Visual quality objectives	Maximum Allowable Disturbance (%) and Green-up Height (metres)
1. Inside Passage	Preservation	1% and 7 metres
	Retention	5% and 7 metres
	Partial retention	15% and 7 metres
2. Skeena River Corridor	Preservation	1% and 7 metres
	Retention	5% and 7 metres
	Partial retention	15% and 7 metres
3. Portland/ Work Channel	Modification	25% and 4 metres
4. Douglas/Gribbell	Modification	25% and 4 metres
Integrated resource management areas	N/A	33% and 3 metres

Source: MOF, 1998a, MOF, 1999

Notes:

- ☐ The Inside Passage portion of the North Coast LRMP is defined by the ferry route from Prince Rupert south to the district boundary.
- ☐ The Skeena River Corridor is the viewshed from Highway 16 from Prince Rupert to the boundary with Kalum Forest District and includes the viewsheds of Prince Rupert and Port Edward.
- ☐ Portland/Work Channel includes the Khutzeymateen and Observatory Inlets.

The Inside Passage and Highway 16 Corridor have particularly high visual values (large numbers of viewers, greater expectations for scenic quality). The Inside Passage is traveled by visitors from around the world and its scenic values are recognized internationally. The Skeena River Corridor is the main route to the Interior, passing through spectacular vistas of the Skeena River and the Coast Mountains. VQOs in these two zones range from preservation (no visible harvesting) to partial retention (moderate visual impact). The Portland/Work and Douglas/Gribbell zones have moderate visual values and have been assigned modification VQOs, which allow greater flexibility for forest harvesting activities when managing for visual quality (Table 27).

Meeting VQOs through visual landscape design is challenging in coastal forests because of their visibility, steepness, low visual absorption capabilities, and fewer options for alternative silviculture systems. The steep terrain and tall trees often leads to significant negative visual impact from logging. Linear alterations, such as roads, can have severe and long-lasting visual impact. Partial cutting, which can be of visual benefit, is not always a viable option in this landscape, primarily due to economic infeasibility, e.g. due to the high cost of infrastructure such as roads.

To date, forest licensees have been reluctant to log in high value visual corridors. There is increasing pressure to harvest in these areas as options are reduced elsewhere. In October 2000, when the Chief Forester announced his AAC decision for the North Coast, he specified that the 154,000 m3/yr (27%) of the AAC would be attributable to the area north of the Nass River and to scenic areas, including the Inside Passage, and therefore "partitioned" from the remaining AAC. This was done to ensure that 100% of the harvest does not take place on 73% of the timber harvesting landbase. If the licensees tend to find this partitioned area uneconomic for harvesting, the Chief Forester indicated that some or all of these lands could be removed from the timber harvesting land base in the future. The Forest District is looking into creative methods of visual landscape design and alternative harvesting systems to manage visual quality while allowing harvesting to proceed.

As the popularity of water-based recreational activities (kayaking, fishing charters, sailing, etc) increases, there is increasing pressure to manage visual quality in high use recreational areas outside of the existing scenic area zones. This includes viewscapes from marine anchorages and from travel corridors on the water. One of the challenges with undertaking visual impact assessments from the ocean is with defining viewpoints. The infinite number of potential viewpoints tends to subject large areas of the coast to visual management, with associated constraints on timber operations and impacts on timber supply.

4.4.4 Strategic planning issues related to recreation, tourism, and visual quality

- ☐ The level of use in some recreational areas is so high that the quality of the recreational experience is being diminished (e.g. Bishop Bay Hotsprings).
- ☐ It may be necessary to consider limiting recreational access to ecologically sensitive areas e.g., restricting access onto Lucy Island when birds are nesting.
- ☐ Interactions between bears and humans can result in increased bear mortality. Each year, numerous bears are shot because they have become accustomed to garbage and have become a threat to people.
- ☐ Karst landscapes (limestone) are a unique recreational feature. These landscapes also have important ecological characteristics.
- ☐ Areas that provide good marine anchorages also have desirable features for locating log dumps or log boom storage areas (e.g., deep water, sheltered), resulting in conflicting objectives for use.
- ☐ The planning table may identify visually sensitive areas (i.e., scenic areas), including viewscapes from high use areas such as popular anchorages and recreational areas, in addition to or as a refinement of the existing scenic area zones. The potential impact of assigning additional visual quality constraints to resource development activities such as timber harvesting and development of mineral occurrences will need to be considered as part of LRMP discussions.

4.5 Fishing

The fishery in the North Coast LRMP area is split into three categories: commercial, recreational, and First Nations. Although each of the three groups harvests at various scales and uses different techniques, all three direct the greatest effort toward salmon, groundfish and shellfish.

The marine fishery is managed by the Department of Fisheries and Oceans (DFO). DFO has divided the coast into "Statistical Areas" to help keep track of catches. The North Coast plan area contains portions of 10 statistical areas. Areas 3xy, 3z, 4, 5, 103, 104, 105 and 106 are contained virtually fully within the planning area, while only portions of areas 6 and 101 are included (Figures 3 and 4).

4.5.1 Commercial

More than 80 species of finfish, shellfish and marine plants are grown, harvested and marketed by B.C.'s seafood industry. These include salmon, groundfish, shellfish (invertebrates) and herring (see Section 3.4: Marine and Coastal Biological Resources). The industry varies by season and year and numbers of fish caught fluctuates with populations of individual species. The commercial fishing industry has two primary components within the planning area: harvesting and processing. Methods used to harvest depend on the target and include a variety of nets (gillnet, seine, trawl), hooks and lines (troll and longline), traps and diving. Aquaculture (the farming of finfish, shellfish, and plants) has become a competitor to harvesting natural (or enhanced) stocks and will be discussed in Section 4.6. Aquaculture.

Salmon

Salmon has been the backbone of the commercial fishery in British Columbia since the late 1800s (Gislason *et al.*, 1998). All five species of salmon are harvested in commercial fisheries: sockeye, pink, chinook, chum and coho. The three general types of boats in the fishery are classed by the gear they use:

- Seiners set large nets that can be closed or "pursed" to trap fish;
- Gillnets suspend nets to entrap fish by their gills or fins; and
- Trollers drag lines with lures to hook fish.

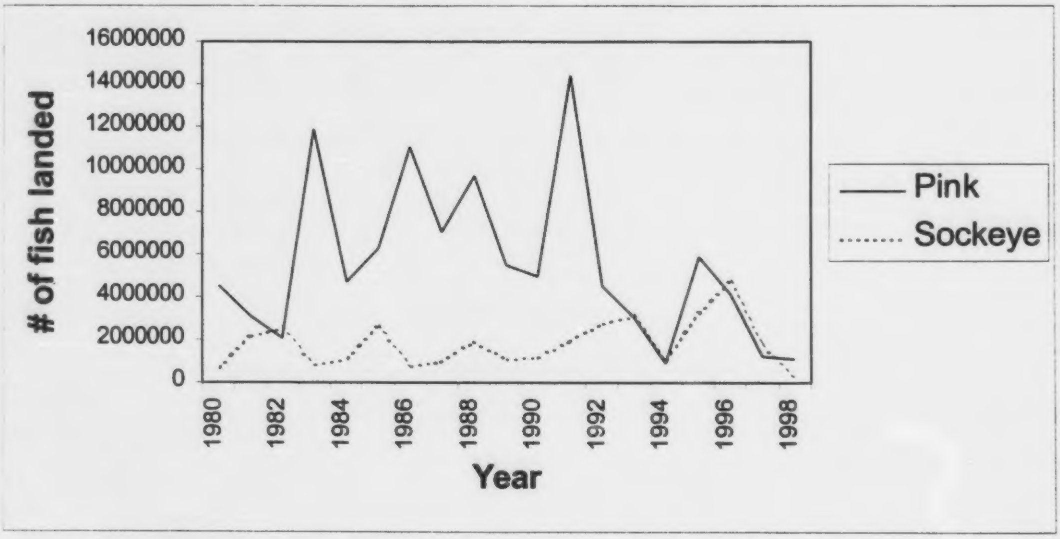
The commercial salmon fishery in British Columbia experienced a considerable decline in the later half of the 1990s. The industry in has changed significantly over the past decade due to several compounding factors:

- Increased world-wide wild and farmed salmon harvest has reduced prices;
- Changes in oceanographic conditions may be affecting ocean survival and could negatively impact catches in the future;
- The Pacific Salmon Revitalization Strategy or "Mifflin Plan" has changed the fishery by reducing the number of fishing vessels and altering the licensing system. The strategy includes a voluntary licence retirement program or the "Buyback"

plan, single gear licensing, area licensing (dividing the coast into 2 or 3 zones for each gear type), and provisions for one vessel to have more than one licence, called "stacking". Stacking allows the licence holder to fish additional areas or gear (Gislason *et al.*, 1998).

Catches have always fluctuated, often significantly, from year to year. The overall catch trends vary from species to species. Pink, coho and chinook salmon landings have declined, while sockeye and chum catches have increased (Figures 3 & 4). Landings in the pink fishery, which was relatively strong between 1983 and 1991, have dropped dramatically since the peak in 1991. The 1998 catch was the lowest catch in the past 18 years (1,076,744 fish compared to an average of 5,882,033 over the same time frame). Coho catches have been declining steadily since the early 1980s. Several stocks within the Skeena watershed are now considered at moderate to high risk of extinction (Morrell, 1998). In 1998 and 1999, DFO implemented wide ranging restrictions on coho fishing. In 1999, coho fishing was either banned or limited to a non-retention fishery throughout virtually the entire LRMP planning area. The exception was Portland Inlet, where limited retention was allowed for the First Nations and recreational fishery. These restrictions resulted in strong coho returns to the Skeena River system in 1998 and 1999 (Wiens, 2000), which may be a starting point from which to rebuild stocks. Chinook catches have also been declining steadily since the early 1980s. Since 1993, the catches have been well below the 18 year average of 62,484 fish. 1998 was the poorest year, with only 9,778 fish landed.

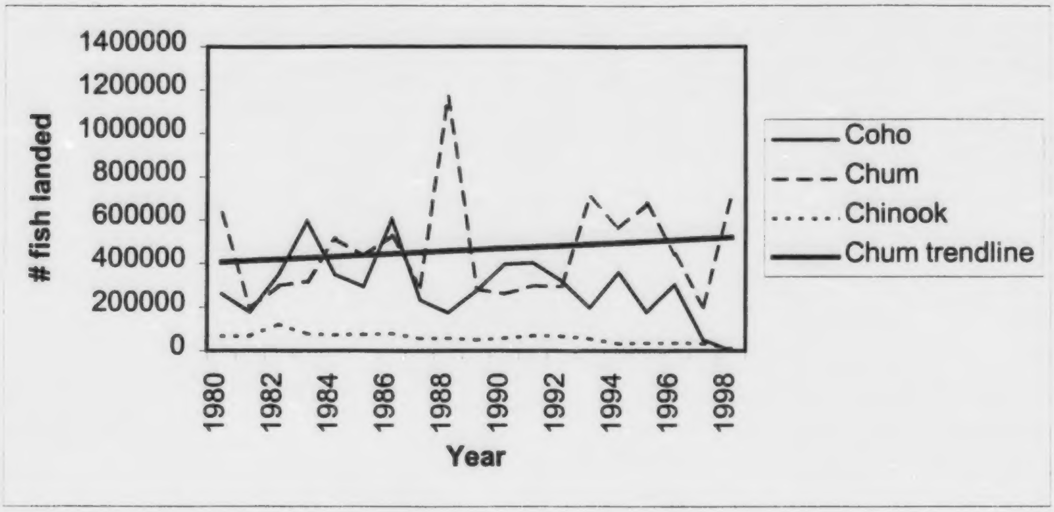
Figure 3. Approximate number of pink and sockeye salmon landed in the commercial fishing industry in the North Coast LRMP area between 1980 and 1998.



Source: Spreadsheet from DFO regional saleslip database provided by Brian Spilsted

Caution: Data is for statistical areas 3,4,5,6,103,104 and 105, and does not match exactly with the LRMP boundaries.

Figure 4. Approximate numbers of coho, chum and chinook salmon landed in the commercial fishery between 1980 and 1998.



Source: DFO spreadsheet provided by Brian Spilsted

Caution: Data is for statistical areas 3,4,5,6,103,104 and 105, and does not match exactly with the LRMP boundaries.

Despite declining catches for pink, coho and chinook, landings of chum and sockeye appear to be relatively stable or increasing. In fact, since 1993 more chum have been caught than any other salmon species according to catch statistics. Despite a very poor year in 1997, the fishery bounced back in 1998. It was the only fishery with an increase in numbers of fish landed. The sockeye catch has been increasing steadily since 1980. The peak year within this time period was 1996, with 4,731,245 fish landed. In 1998, the number of fish harvested plunged to an 18 year low (281438 fish) – a combination of the cyclical pattern in numbers of sockeye combined with restrictions to decrease the by-catch of coho.

Other Pelagic Fish

The most valuable of the pelagic fisheries in the North Coast LRMP area is the herring fishery. Several products are sought from herring: whole fish for bait, roe, and spawn on kelp. The herring roe fishery is the largest, with 23,206 tonnes collected in 1998. Almost 51 tonnes of herring were caught for bait and roughly 47 tonnes of spawn on kelp were harvested in 1998 (DFO, 2000).

Groundfish

The groundfish fishery is the most diverse and economically valuable of any segment of the British Columbia commercial fishery. Targeted types of fish include codfishes, flatfishes (including halibut), and rockfishes. The key species and their status are described briefly in Section 3.4.3. The largest fisheries for groundfish in British Columbia are hake, rockfish and halibut (Table 28). Halibut and sablefish (blackcod) dominate the groundfish catch in the

North Coast LRMP area. These fish also comprise the highest value commercial fisheries in the plan area. Primary fishing methods are trawling and hook & line.

Table 28. Quantities of groundfish caught in British Columbia in 1998.

Fish category / species	Quantity Harvested (tonnes)
Hake	51,277
Rockfish	20,215
Halibut*	5,271
Sole	5,047
Turbot	3,783
Sablefish	3,490
Dogfish	3,520
Lingcod	2,355

*Halibut landings are reported as dressed weight, head off. All other fish are reported as round weight. One tonne = 2204.6 pounds.

Source: DFO, 2000

Shellfish

The main shellfish harvested in British Columbia are described briefly in Section 3.4.4. The status, catch, number of licences, and resource outlook for key shellfish are summarized in Table 29. Note: unless otherwise stated, statistics and summaries are based on provincial numbers.

The geoduck clam supports one of the most valuable fisheries in British Columbia. Landed values peaked in 1995 at $42 million, and have since dropped to roughly $30 million. Beds are still being discovered in the North Coast LRMP area, but quotas for the province are expected to remain at 1997 levels (1,796 tonnes) in the near future (DFO, 1999b).

The dungeness crab forms the bulk of the commercial crab fishery in the province. In 1997, the value of the fishery was almost $23 million. Dungeness crab populations comprising the fishery within the North Coast LRMP area are centred in Hecate Strait and Dixon Entrance, with major fisheries occurring in Hecate Strait and the Skeena River estuary. Efforts in the commercial crab fishery increased dramatically in the 1990s due to the development of new markets, increased value of the catch, improved harvest technology and reduced opportunities in the finfish industry. The north coast crab population, which tends to fluctuate dramatically, is currently shrinking. The outlook is for a decline in this fishery off the North Coast. (DFO, 1999a).

The provincial red sea urchin fishery is currently stable. Landings are relatively consistent and have been stabilized by quotas since 1993 (DFO, 1999e). In 1996, 5,753 tonnes of urchins were landed ($11.4 million dollars value) in BC. 76% of the quota in 1996 was allotted to DFO's North Coast management area. In 1999, the quota increased by approximately 300 tonnes from 1996 levels (5,601 vs. 5,360 tonnes), and 81% was allocated to the north coast (DFO, 1999e). A long-term fishing strategy is being developed for the urchin fishery.

The shrimp fishery experienced a dramatic increase in catch in 1995 and 1996 due to increased effort as the result of licence buybacks in the salmon and groundfish fisheries. Between 1987 and 1994, the number of vessels along the entire coast with reported landings ranged between 158 and 190. In 1996, that number jumped to 222. Due to the increased pressure, catch ceilings based on historical catch levels were implemented in 1997 and by the 1998/99season, only 187 vessels reported catches. Current catches may be higher than populations can support (DFO, 1999f). The prawn fishery has increased its efficiency through the 1990s. In response, DFO has shortened the season. The prawn fishery produced a landed value of $26 million in 1997, which fell to $18 million in 1998 (DFO 1999d).

The sea cucumber fishery is relatively small limited entry dive fishery. The landed value in 1998 was about $1.1 million. Approximately 25% of the coast is zoned for experimental fisheries. Opportunities for growth may exist in the sea cucumber industry (DFO, 1999c).

4.5.2 Recreational

4.5.2.1 Marine fishery

The recreational angling experience is influenced by numbers of fish, success rates, aesthetics, weather, congestion, and companionship (Gislason *et al.*, 1998). Marine angling opportunities can be classified into three categories: charters, lodges, and independent anglers. Charters are generally one-half to one day long and are guided. Lodges offer 3-5 day packages comprising accommodation, food, gear and potentially guides (*Ibid.*). Independent anglers are self-supported, supplying their own gear and transportation.

Since the mid-1990s, the numbers of people fishing recreationally off the coast of BC has declined as indicated by trends in fishing licence purchases. Marine recreational fishing licences for the entire coast peaked in 1993 and have declined since then. Licences for residents mirrored this pattern, while non-Canadian licences peaked in 1994. (Gislason *et al.*, 1998).

The marine recreational fishery targets salmon, groundfish and shellfish. The salmon fishery is the largest. The three most commonly caught salmon species within the planning area are chinook, coho and pink. Catches of all three have been declining (Figure 5). In 1998 and 1999, DFO implemented wide-ranging restrictions on coho fishing. Within the planning area, no coho were to be killed, with the exception of Portland Inlet, where limited retention for the First Nations and recreational fisheries was permitted. Halibut, rockfish and lingcod are the primary groundfish targeted in the recreational fishery. These fish are becoming more difficult to find and catch. As a result, recreational fishers are turning interests toward shellfish. Some of the more popular species include dungeness crabs, prawns and clams. Crabs are facing increasing pressure due to improved access, increase in the number of fishing lodges and general increase in tourism (DFO, 1999a). The prawn fishery is also increasing in popularity (DFO, 1999d). Bivalves (clams and mussels), with few exceptions, are closed to recreational harvesting due to lack of available testing for paralytic shellfish poisoning and growing water[23]. Exceptions include razor clams in statistical areas 3,4, and 5, and weathervane scallops. The razor clam recreational fishery corresponds to the commercial fishery; the scallop fishery is opened in the winter.

Table 29. Status, catch, number of licences, outlook and potential negative impacts on populations of the major types of shellfish in the British Columbia commercial fishery.

Target	# of licences (Entire coast 1998)	Harvest Methods	Catch (Entire coast 1997)	Resource Status	Outlook	Potential impacts
Geoducks	55 (stable)	Divers	1,817 tonnes (1996)	Beds still being discovered in the North Coast plan area.	Quotas should remain at 1997 levels	• Fishery • Log dumps • Ocean dumping and dredging • Nearshore development
Crabs (Dungeness)	220 (stable-decreasing slowly)	Traps	3,083 tonnes	Populations declining; catches declining since 1993.	Continued decline in catch in near future (North Coast – Area A)	• Fishery • Log storage • Estuary development
Prawn / shrimp	Shrimp: 248 (stable) Prawn: 251 (stable)	Trawl (shrimp) Traps (prawns).	Shrimp: 3,255 tonnes Prawns: 1,800 tonnes	Unknown for most species; prawns thought to be healthy in most coastal areas.	Dependant on Asian Market; Current efforts may be higher than stocks can support.	• Fishery • Nearshore development • Log storage, handling • Fish farms
Red/ green sea urchins	110 (stable) Red urchins only.	Divers	8,448 tonnes (1997/98)	Some beds closed due to overfishing.	Long-term strategy being developed.	• Fishery • Sea otters
Sea cucumbers	85 (stable)	Divers	233 split tonnes	Unknown	Expansion opportunities available.	• Fishery • Log storage • Fish farms
Bivalves (e.g. Clams) – excluding geoducks	Closed in the planning area, except for the razor clam fishery in statistical areas 3, 4 and 5.					• Fishery • Shoreline and nearshore development • Fish farms • Industrial pollution • Sewage
Abalone	0	Divers	0	Closed due to low populations	Poaching is continued concern	• Poaching

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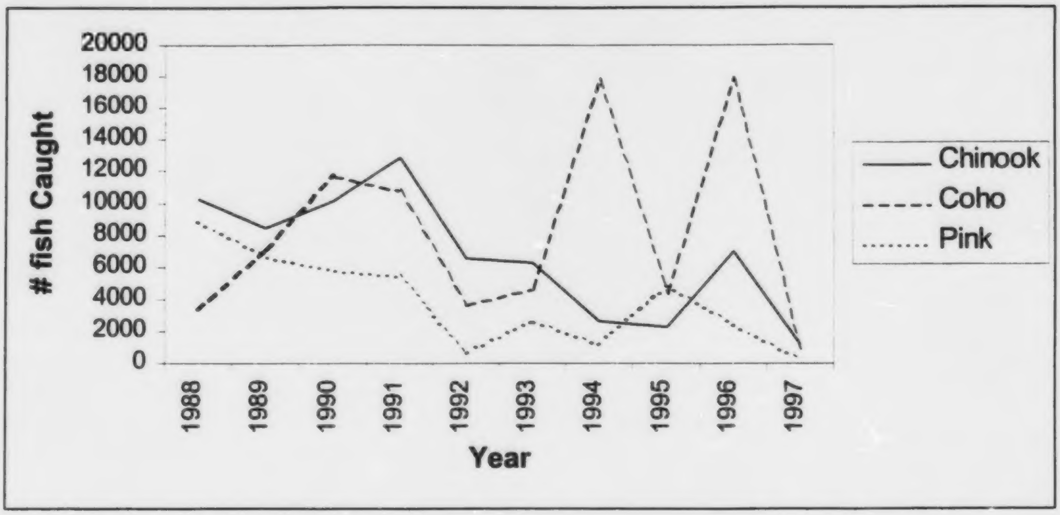
[23] Local groups are working toward resolving this issue.

Figure 5. Numbers of salmon caught by the recreational fishery between 1988 and 1997 for the top three species caught in statistical areas 3,4,5 and 6.



Source: Fisheries and Oceans Recreational fishery database

Caution: These numbers are approximate and should not be considered accurate or complete.

4.5.2.2 Freshwater fishery

In the North Coast, the freshwater sport fishery is dwarfed by the marine recreational fishery. This is primarily due to the geography of the area. Most lakes and rivers in the North Coast are remote and difficult to access. Nonetheless, the Skeena River watershed is one of the few remaining major Pacific watersheds where record-size chinook and wild, summer-run steelhead can be found. The combination of a variety of species, large size of fish, fly-fishing opportunities, and pristine wilderness sets this watershed apart from any other area in North America (ARA, 1991). While most of the fishing in the Skeena watershed occurs upstream of the LRMP area, the Skeena River is fished heavily as are some of tributary streams and rivers near the mouth of the Skeena.

The freshwater sport fishery has two components: guided and non-guided. The ratio of guided to non-guided fishing within the LRMP area is unknown. Non-guided anglers are most often locals and other BC residents. A number of other Canadians and foreign tourists also choose to fish unassisted. However, a significant market exists for all-inclusive fishing vacations – the types often provided by guides to tourists. Twenty-seven freshwater fishing guides operated on the major rivers within the planning area. The Skeena River downstream of the Exchamsiks River[24] was the most popular area, with 21 guides allocated a total of 3816 angler days in the 1999/2000 fishing season. Nine guides applied to operate on the large tributaries at the mouth of the Skeena in the 1998/99 season. A total of 175 angler days were granted to five guides for the Khyex River and 163 were approved for the Ecstall River. Two guides were granted a total of 115 days on the Kwinamass River (AGMS, 2000).

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[24] This section of the Skeena River (fully contained within the North Coast Planning area) is unclassified water. Upstream of this point, the Skeena River is a class 2 river.

River anglers focus effort on steelhead trout, coho salmon and chinook salmon. The two rivers within the LRMP area specially classified due to unique and exceptional angling qualities are the Ecstall and Kwinamass rivers. Both are Class 2 rivers[25]. The coho fishery has been closed for the past several years, as coho populations have become a serious conservation concern.

Lake fishing is somewhat limited to a flyin fishery due to the remote nature of most of the lakes.

4.5.3 First Nations fishery

First Nations have traditionally fished for food, social and ceremonial purposes. Coastal First Nations, including the Tsimshian, Nisga'a, Haisla and Heiltsuk First Nations, rely heavily on harvests from the sea. Much of the information about traditional and current uses of the fisheries resource by First Nations belongs to the First Nations, and requires their permission to collect and use. First Nations contacts can be obtained through Randall Barnhart with Fisheries and Oceans Canada, in Prince Rupert.

Fisheries and Oceans Canada assign numbers for management purposes to stocks utilized by First Nations (Table 30). These numbers are not rigid and are not allocations. However, the resources used by the Nisga'a First Nation have become allocations under the Nisga'a Treaty. First Nations food, social and ceremonial needs are priorities second to conservation and before other users.

Although not included in Table 30, eulachon is also a fish of great importance to First Nations. They collect these fish in river systems using beach seines, stationary conical nets and dip nets when they return to spawn.

Shellfish have also traditionally played a large role in the diet of the coastal First Nations. The best evidence is clam shell middens along the coast, some of which may be thousands of years old. First Nations harvest a range of shellfish species, with the exception of bivalves (restricted due to marine biotoxins of public health significance) and abalone (restricted due to conservation concerns).

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[25] A class 2 river is the second of two classes introduced in 1990 to provide a diversity of angling opportunities, to maintain quality fishing, and to improve regulation of the fish guide industry. A class 2 river is more accessible than a class 1 river, but still represents a quality fishing experience. It typically has more local use than a class 1 water. Angling guides are limited to the guided angler-days specified in the water-specific management plan. Angling use by non-BC residents can be limited, but use by BC residents is not restricted, except as outlined in a specific angling use plan.

Table 30. Numbers of fish assigned for management purposes to the First Nations food, social and ceremonial fishery in the North Coast LRMP area.

Species / fish category	Management Number
Sockeye	132,500 pieces
Pink	11,000 pieces
Chinook	14,000 pieces
Chum	4500 pieces
Coho	8500 pieces
Halibut	89,000 lbs.
Sablefish	22,500 lbs.
Other groundfish	56,000 lbs.
Herring (for production of herring spawn on algae)	604,000.4 tonnes
Whole herring	2000 tonnes
Seals / Sea lions	200

Source: E. Antilla (pers. comm.)

4.5.4 Strategic planning issues related to fishing

- ☐ Crowding and visual quality can affect the quality of angling experience
- ☐ Integrated management of lakes for fish and wildlife habitat, recreation/ tourism and resource development activities.
- ☐ Conservation of fish stocks. Healthy fish stocks are the basis for healthy fisheries. Salmon are also key components of the food chain and nutrient cycle for terrestrial and aquatic ecosystems.
- ☐ Fish stocks at risk, including coastal Dolly Varden and sea-run cutthroat.
- ☐ Maintenance of aboriginal fishing sites.

4.6 Aquaculture and Marine Plant Harvesting

Aquaculture is the farming of fish and marine plants. The aquaculture industry in BC consists of finfish, shellfish and marine plant farming. Marine plant farming is classified as a provincially regulated fishery. Currently, only one full production aquaculture facility (an oyster farm) exists within the North Coast area. Several small-scale shellfish pilot projects (oysters and scallops) are also operating within the area. Wild roe-on-kelp harvesting occurs in suitable locations within the North Coast LRMP area.

4.6.1 Finfish farming

While there is growing interest in the culture of alternate species such as halibut and black cod, salmon dominates the finfish aquaculture industry in BC. In salmon farming, fish are hatched from eggs and raised in captivity until they are ready for market. Once eggs hatch, the juvenile fish are moved to freshwater rearing tanks or lake net cages for several months up to a year. Once they smolt (their kidneys are ready for salt water) the fish, now called smolts, are transferred to net-cages along the coast where they are raised to market size.

Salmon farming has been active as an industry for approximately 20 years in British Columbia. Until the late 1980s and early 1990s, chinook and coho were the primary farmed salmon species in BC. However, industry shifted primarily to Atlantic salmon because it is a species better suited to farming (EAO, 1997). In 1997, British Columbia was the fourth largest producer of farmed salmon in the world. With steadily increasing harvest levels, farmed salmon harvest exceeded 40,000 tonnes, with a value of $175.5 million in 1997. This exceeded the value and nearly matched the total tonnage of wild salmon that year. Farmed salmon provides approximately half of the total world salmon consumption of 550,000 tonnes. However, B.C.'s share of the global market has declined from 10% to 4%, largely due to the comparatively greater growth in other countries, such as Norway, Scotland and Chile and a cap on the number of existing farms in BC. No finfish farms are currently operating in the North Coast planning area.

Marine fish farming has a significant growth potential in BC generally and in the North Coast area specifically. A 1999 study concluded that marine fish farming has the potential to contribute $1 billion dollars annually to the provincial economy and create 20,000 full time equivalent jobs by the year 2010 (Coopers and Lybrand, 1999). This potential exists because the province has a significant inventory of capable aquatic lands; long-term markets for finfish products, increasing farm productivity and promise for new species culture. The study also found that only a minute percentage of biophysically capable aquatic lands are currently under culture. The greatest limiting factors to growth have been a cap on industry expansion and suspension of new site development.

Although the extensive B.C. coastline has very favourable conditions for aquaculture, finfish operations only occupy 0.15% of the coastal nearshore area (at, or shallower than, 100 metres depth). Biophysical capability studies for salmon farming in the plan area indicate a significant number of moderate (i.e. acceptable), and a few good areas for salmon aquaculture development.

Although potential exists for growth in the aquaculture industry, it has been highly controversial with some members of the public having voiced several concerns over the years. These concerns include impacts of escaped farmed fish on wild stocks [escaped Atlantic salmon have successfully spawned on Vancouver Island], disease and parasite transmission, net-pen waste discharges, sea mammal and bird control measures, siting of operations, and issues connected with the use of antibiotics (EAO, 1997).

In 1995, the provincial government officially suspended the issuance of new tenures for salmon farming. It also directed the Environmental Assessment Office (EAO) to conduct a comprehensive public review of the adequacy of current methods and processes used by the

Ministry of Environment, Lands and Parks and the then Ministry of Agriculture, Fisheries and Food (Currently, Ministry of Fisheries) in regulating and managing salmon farming. The EAO concluded that salmon aquaculture, as currently practiced, and at current production levels, presented a low overall risk to the environment. However, the EAO also tempered that conclusion with reservations regarding localized seabed impacts and gaps in scientific information. Consequently, it recommended continuation of the current practice of farming salmon in open net cages, along with 49 detailed recommendations on measures to prevent unacceptable impacts and reduce uncertainty.

After considering the conclusions of the EAO study, the provincial government announced a salmon aquaculture policy framework (SAPF) in October 1999. This policy recognizes that the salmon farming industry provides important opportunities to the residents of coastal communities. The policy addresses many of the concerns with aquaculture, while limiting growth in the industry. The number of tenures province-wide is capped at the existing 121 for a period of two years. The SAPF also allows for:

- up to five marine and five freshwater new pilot research and development sites for green technology and closed containment systems,
- a new waste management regime, strictly enforced environmental standards,
- escape prevention and recovery programs,
- increased opportunities for consultation with First Nations and coastal communities,
- relocation of poorly sited farms over two years, and
- streamlining the tenure and referral process.

Plans are to review the performance of the industry in the fall of 2001 after two years. This means that there will not be any new salmon aquaculture development in the province beyond the 121 existing tenures coast wide until the SAPF is reviewed in 2001. This means there may be opportunities for relocation of poorly-sited farms from southern areas of the province to better sites in the plan area, depending on interest from the industry, infrastructure and cost of production requirements and opportunities for joint venturing with First Nations. There may also be some opportunity for development of new non-salmonid finfish farms in the North Coast area.

4.6.2 Shellfish culture

Shellfish culture is much less controversial than salmon farming. Pacific Oysters have been cultured in British Columbia since the early 1900s. In the last decade, Manila clams and a Japanese scallop hybrid has also been farmed commercially in the province. Until recently, the industry has grown slowly with 1997 landings of oysters, clams and scallops totaling 4.7, 1.0 and 0.09 tonnes respectively. This translated to a landed value of $4.9, $4.6 and $0.6 million dollars, respectively for each species cultured.

In the North Coast planning area, one licensed oyster farm is operating on Porcher Island. Several additional pilot projects testing the feasibility of oyster and scallop culture are also underway within the planning area (Heath, pers. comm.; Dobie, pers. comm.). Two abalone farms have also been proposed. One is licenced, but has not started operations on-site (Dobie, pers. comm.). Recently completed biophysical capability studies of shellfish culture potential in the North Coast have identified some potential for shellfish culture in the plan area.

Like finfish farming, shellfish culturing has a significant potential for growth provincially (Coopers and Lybrand 1999). Shellfish farming could become a $100 million dollar industry, with the ability to create more than 1,000 person years of employment in British Columbia coastal communities over the next ten years. This is due to the presence of significant long-term market opportunities, technological improvements, development of new culture species and an inventory of capable aquaculture lands. Lack of access to new farm sites has been the primary factor limiting the industry (*Ibid.*).

The provincial government announced the Shellfish Development Initiative in July 1999. The purpose of this program is to promote shellfish farming with First Nations and other coastal communities. The land available for shellfish aquaculture will be doubled over the next 10 years and tax structures will be changed (BCAL, 1999).

The North Coast Regional Shellfish Planning Committee, formed in January 1999, has formulated a strategic plan for shellfish aquaculture along the North Coast. The committee consists of members from communities along the coast and its purpose is to develop shellfish farming in the area.

4.6.3 Marine plant harvesting

Both the commercial growing of, and harvest of naturally growing marine plants is classified as aquaculture, whereas the harvest of wild marine plants is classified as a provincially managed fishery. Marine plants include algae (e.g. seaweeds such as kelp and microscopic plants called phytoplankton) and vascular plants (e.g. eelgrass). The marine plant of greatest economic importance is the giant kelp, *Macrocystis*, harvested for herring spawn-on-kelp. Other kelps, including *Egregia, Hedophyllum, Alaria, Nereocystis* and the vascular plant *Salicornia* (sea asparagus) are harvested for a variety of uses such as dried and fresh food products and the manufacture of fertilizer.

The 1997 provincial harvest of marine plants included 105.5 tonnes of *Macrocystis* for spawn-on-kelp and 56.5 tonnes of other seaweeds for other purposes.

Within the planning area, wild roe-on-kelp harvest is the most important commercial activity involving marine plants. However, a kelp farming operation has also been proposed for the area.

A 1995 provincial market study found that the total size of the edible food market for seaweed products is estimated at about $30.6 million from a biomass yield of less than 10 tonnes. This provincial total amounts to about 3% of the world harvest. The study also found that a large majority of seaweed distributors, wholesalers, retailers and restaurant operators contacted are interested in sourcing their products from British Columbia. The study concluded that, while there does not appear to be a potential for a large-scale commercial seaweed industry in BC, a number of potential niches have been identified.

4.6.4 Strategic planning issues related to aquaculture

- ☐ Water quality
- ☐ Compatibility of aquaculture development and resource conservation and use.

4.7 Hunting, Guide-outfitting and Trapping

4.7.1 Hunting

Hunting - general

Hunting is one of many recreational and tourist pursuits in the planning area. The vast majority of hunters in the LRMP area are residents of British Columbia. Non-resident hunters are generally destination tourists who come to the area specifically to hunt. They are required to hire a licensed guide[26] when hunting big game.

Portions of five wildlife management units (MUs) overlap with the LRMP area: 6-3, 6-10, 6-11, 6-14 and 6-15. Each of these management units extends well beyond the boundaries of the planning area, so gathering statistics solely for the plan area is not possible. MU 6-15 has been excluded from the hunting statistics presented below because it overlaps minimally with the planning area.

Though mountain goat and bears are likely the most common big game species, moose and deer are the most commonly hunted species within MUs 6-3, 6-4, 6-11 and 6-14, followed by black bear, mountain goat and grizzly bear (Table 31)[27]. Hunting effort has fluctuated considerably from year to year for all species. Deer was the only species for which the overall trend between 1989 and 1998 was relatively stable both in terms of hunting effort and number of kills. The deer hunt was comprised solely of resident hunters. Effort ranged from 650 hunter days in 1993 to 1599 days in 1991, and averaged 1139 days per year. Forty-six deer were killed on average per year. Although the overall black bear hunt appears to have decreased, black bear hunting by residents has remained relatively constant, with an average of 1068 hunter days and 54 kills per annum. The decrease in guided hunting for this species has resulted in the overall decline (see the Guide-Outfitter section for statistics on guided hunts). Effort in the moose hunt has fallen sharply since 1992. Kills per unit effort within the same time period increased, suggesting that lack of success was not a contributing factor to the declines in hunter days. Grizzly hunt kills remained relatively constant throughout the 1990s, with an average of 2 to 3 bears killed per year. The number of goats killed declined between 1989 and 1997. Between 1989 and 1991, 13 to 20 goats were killed each year, whereas between 1992 and 1997, only 4 to 11 goats were harvested per annum. Although hunter effort for these compulsory inspected species[28] appeared to have declined through the 1990s, the statistics may not be accurate and could be misleading. For instance, in four cases, animals were reported as killed with no associated effort numbers.

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[26] Residents of Canada have the option of hunting with a resident of BC who has a "permit to accompany".

[27] The reliability of the data is suspect. Please use caution when interpreting the data and the brief summaries provided by the authors.

[28] For compulsory inspected species all kills are recorded. All grizzly bears and most accessible goat populations are on Limited entry hunting only. In order to determine hunter effort there is a questionnaire sent out to hunters

Hunting – First Nations

Hunting is a traditional activity of First Nations and has important cultural significance. First Nations have a constitutional right to hunt for traditional purposes barring any conservation and public safety concerns. As such, they are exempt from many provincial licence requirements for hunting wildlife and migratory birds.

Under the Nisga'a Treaty, Nisga'a hunters and trappers have been fully integrated into the provincial wildlife management system. Annual management plans will specify the methods, times and locations of the Nisga'a hunt for domestic purposes. The Nass Wildlife Area (NWA) has been established as part of the Treaty to define the area where the Nisga'a can exercise their treaty right to hunt. The NWA includes the core Nisga'a Lands and surrounding Crown land, including the entire area within the North Coast LRMP north of the Khutzeymateen watershed (Map 4).

The Nisga'a will develop an annual management plan for the NWA, outlining Nisga'a hunting activities for the year, including harvest levels, and method and timing of hunt. The annual management plan will be reviewed by a Nass Wildlife Committee (NWC), composed of Nisga'a, provincial and federal representatives, who will then submit their recommendations to the Minister of Environment, Land and Parks for approval.

4.7.2 Guide-outfitting

Small portions of four guide-outfitting territories overlap approximately half of the North Coast LRMP area (Map 15). The remaining half is non-guided. Between 1989 and 1998, black bear was by far the most common species sought by guided hunters, followed by moose. However, although effort for black bear hunting remained relatively constant for residents, it plunged dramatically for guided hunters. Hunting effort for black bear dropped steadily from 505 days in 1989 to just 14 in 1998. This significant is attributed to decreased guiding in the area and quotas. The primary guide territory (labelled as non-GOT on Map 15) has not been operating in recent years and two of the remaining territories have been in the process of changing hands. In addition, quota restrictions were instituted for black bears on at least two of the territories.

Guides also lead hunts for grizzly bear and mountain goat within the LRMP area. However, for these two species, the number of hunter days and kills for guides were not separated from resident hunters in data received from B.C. Environment.

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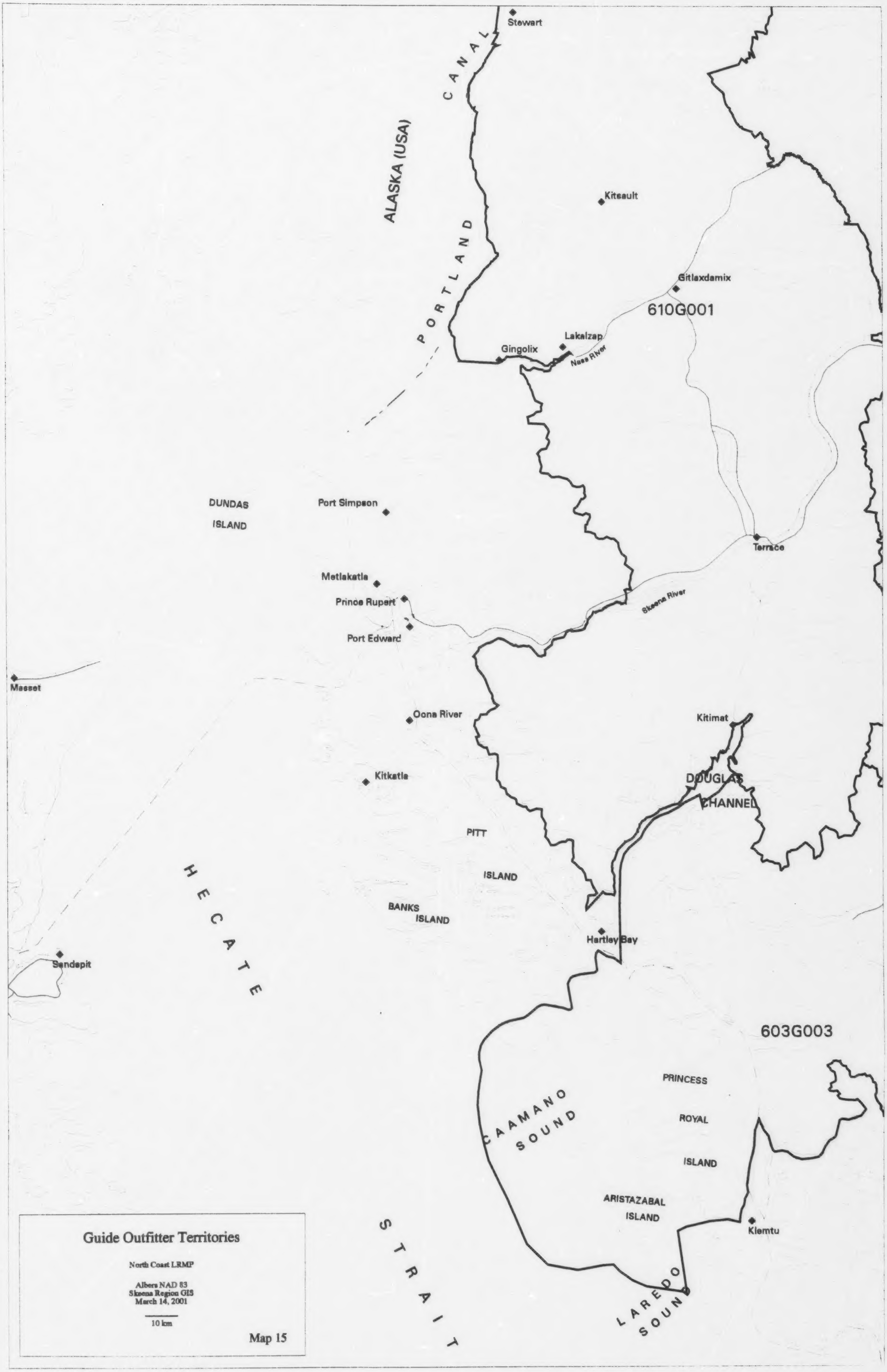
who received an LEH authorization. This questionnaire may or may not be returned by the hunters and therefore may or may not correspond to the number of kills.

Table 31. Days hunted and number of kills (in parentheses) for the main big game species hunted in the North Coast LRMP area.

		Year									
Species		**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Moose*	Residents	4328 (140)	2671 (84)	3051 (120)	4032 (109)	2006 (118)	1682 (88)	1682 (92)	2587 (99)	2461 (101)	2140 (95)
	Guided	14 (0)	17 (3)	0	10 (0)	82 (6)	37 (1)	31 (2)	20 (3)	14 (0)	0
	Total	4342 (140)	2688 (87)	3051 (120)	4042 (109)	2088 (124)	1719 (89)	1713 (94)	2607 (102)	2475 (101)	2140 (95)
Deer*	Residents	1049 (55)	765 (35)	1599 (62)	1530 (42)	650 (15)	1541 (35)	886 (53)	1011 (34)	1073 (57)	1283 (72)
	Guided	0	0	0	0	0	0	0	0	0	0
	Total	1049 (55)	765 (35)	1599 (62)	1530 (42)	650 (15)	1541 (35)	886 (53)	1011 (34)	1073 (57)	1283 (72)
Bear*	Residents	953 (81)	1005 (79)	1061 (64)	932 (44)	1359 (34)	1601 (45)	1047 (33)	911 (48)	700 (51)	1118 (58)
	Guided	505 (67)	420 (75)	320 (81)	67 (11)	336 (42)	190 (21)	77 (3)	64 (8)	20 (5)	14 (3)
	Total	1458 (148)	1425 (154)	1381 (145)	999 (55)	1695 (76)	1791 (66)	1124 (36)	975 (56)	720 (56)	1132 (61)
Mt. Goat#	Days (Kills)	41 (20)	43 (13)	56 (20)	14 (7)	50 (11)	17 (6)	17 (7)	0 (4)	6 (11)	?
Grizzly Bear#	Days (Kills)	20 (4)	19 (3)	11 (2)	6 (1)	13 (7)	5 (1)	0 (2)	0 (2)	0 (3)	?

* Source: MELP summary statistics database. Numbers are for MUs 6-3, 6-10, 6-11 and 6-14 in their entirety and are thus overestimates. MU 6-15 is not included as only a tiny portion extends into the LRMP area and is not included in the calculations. First Nations data is not included in the table.

Source: BC Ministry of Environment. Numbers are based on point locations from the digital file wldwhse.hdfile. Only kills reported on compulsory inspection and guide declaration forms and located within the LRMP area are included in this tally.



Guide Outfitter Territories

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

Map 15

4.7.3 Trapping

Approximately 200 trapping territories overlap the North Coast LRMP area. The number of active trappers is unknown, as many traplines are inactive (Smith, pers. comm.), and each trapping territory can have several registered trappers (Crane, 1996) who may or may not be actively trapping. In addition, any number of assistant trappers who have permission from the registered trapline holders may be trapping on a given trapline.

Despite the large number of territories, relatively few animals are reported to be trapped in the LRMP area compared with other areas of comparable size in the north. The exact number of animals trapped is unknown for several reasons. First, reported kills are based on royalties collected from sales. Second, price plays a large role on the numbers of furs sold on a year-to year-basis. Third, animals caught for traditional or ceremonial purposes are rarely reported (Smith, pers. comm.).

Nonetheless, some potential trends can be seen using the available data. Marten is the most heavily trapped species by a wide margin. Approximately 15 times as many marten are caught annually compared with the next most trapped species, the beaver and mink (Table 32). A few river otters, squirrels and weasels are also trapped. Although the figures vary from year to year, the numbers of trapped marten and beaver appear to have increased slightly over the past decade, while numbers of mink have declined. This may reflect prices of furs and varying interests in targeting specific species.

Concerns re the reliability of data on trapping rules out using this data to make conclusions on populations trends of furbearers within the LRMP area. However, previous studies support that furbearer populations generally decline in areas subject to forest development and habitat conversion (Vanderstar pers. comm.).

Like guiding, trapping is seasonal work and many people supplement their income with other work. Trapping within the North Coast LRMP area has been a traditional activity for First Nations and has important cultural significance.

Table 32. The six most commonly trapped furbearer species in the North Coast LRMP area between 1989 and 1998.

Species	**Year**									
	1989	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**
Marten	394	186	799	441	254	1424	1032	973	813	514
Beaver	78	20	-	7	1	88	57	119	71	25
Mink	123	11	121	28	24	39	11	35	30	18
River Otter	24	3	3	7	1	7	11	28	14	3
Squirrel	-	-	4	-	-	-	-	18	15	28
Weasel	12	-	2	-	1	5	27	-	-	-

Source: BC Ministry of Environment. Numbers are from the file wldwhse.harvest_summary, and are based on trapping territories that overlap with the planning area.

4.7.4 Strategic planning issues related to the harvest of terrestrial animals

- Access:
  - ⇒ Road access is not as much an issue as in other areas of the province. Few areas are accessible for use by recreational motorized vehicles.
  - ⇒ Access planning, through the deactivation of roads or the introduction of controls on public access; can help to decrease impacts on wildlife populations. For example, reduced public road access can decrease opportunities for poaching and minimize displacement of wildlife from their usual habitat.
  - ⇒ Mountain goats and grizzly bears are particularly sensitive to over harvest because of their low recruitment rates. Access that increases opportunities for hunting and poaching, or that increases opportunities for human-bear interactions and potential habituation of bears, will potentially have a detrimental impact to their populations.
- Resource development activities:
  - ⇒ May affect species populations through modification of habitat (positively or negatively depending upon species and type of habitat modification). Harvest systems and silvicultural techniques can be incorporated into forestry management to mitigate impacts to wildlife habitat.
  - ⇒ May impact the aesthetic quality of the wilderness experience for clients of guide-outfitting companies. This includes noise of operations.
  - ⇒ Displacement of animals from preferred habitats due to human activities may result in lowered productivity and potentially increased vulnerability to predation.

4.8 Agriculture and Crown Range

Agricultural potential is low throughout the North Coast LRMP area. Due to soil and climatic conditions, field-cropping activity is limited to isolated pockets of land (Riendeau, pers. comm.). However, with the right market conditions, intensive greenhouse operations may be feasible in the future because of the area's mild climate and the hydroponic techniques employed in most commercial greenhouses.

Agricultural potential is based upon soils information. Canadian Land Inventory is the method used to determine soil/crop classifications. CLI classes 1-5 are suitable for agriculture in the Skeena Agricultural District. However, the soil classes in the North Coast planning area are unknown. To date, CLI inventory has not been conducted for the area. Most of the land with agricultural potential within the province has been placed in the Agricultural Land Reserve (ALR). *The Agricultural Land Reserve Act* was implemented in the early 1970s in an attempt to protect farmland from conversion to non-agricultural use. Within the North Coast planning area, only 1100 ha of land are within the ALR. The largest plot is along the west side of the lower reach of Scotia Creek.

4.9 Freshwater Use

The North Coast LRMP area has abundant freshwater resources. High rainfall and snowmelt during the spring keep water replenished. Most of the streams and rivers in the planning area are relatively short and steep with large fluctuations in discharges due to rainstorms. Freshwater provides important habitat for fish and other aquatic creatures, and is important for all terrestrial animals and plant communities. Water is also used for domestic consumption, recreation, industry, hydropower generation and irrigation (although there is no irrigation in the North Coast LRMP area). This summary will focus on human uses of water resources within the planning area.

Forty-four water licences exist for the North Coast LRMP area (Water Management Branch, BC Environment). Many of these licences have several components; so the actual number regulated points of diversion is 63. Most of the clients are corporations, First Nations and various levels of government including municipalities, regional districts, and the Department of Fisheries and Oceans. Seven licences are Permits over Crown Land for works or flooding of Crown land that extend off private land or tenured Crown land.

Water use is divided into consumptive and non-consumptive use. For instance, in non-consumptive use, the water is generally used for conservation, power or storage purposes and is not removed from the water source. Within the plan area, two of the three most common licence categories are non-consumption and include storage and power. In addition, more water is allocated to power generation than for any other purpose. Domestic use is the most common consumptive water licence type A domestic water licence allows households to draw water from a lake or creek for their own domestic (household) use. The quantity allotted to domestic use is generally 500 gallons per day. A licence is not required for domestic water use under the *Water Act*, provided the water being used is unrecorded water[29]. Although the domestic licence is the most common licence type for consumptive water use, "processing" and community water systems (waterworks) are allocated the largest volumes of water.

Five community watersheds[30] exist within the LRMP area[31]. These watersheds have been classified as community watersheds under the *Forest Practices Code Act* of BC in 1995. Under the *Operational Planning Regulation* of the Code, watershed assessments must be conducted prior to timber harvesting or roadwork within a community watershed or other drainage basin that has significant downstream fisheries or domestic water use.

Table 33. Community watersheds within the North Coast LRMP area.

Community Watershed	Creek	Size (ha)	Comments
Dodge	Dodge Creek	14	On Digby Island
Gabion	Gabion River	1881	Hartley Bay
Shawatlan	Shawatlan River	2488	North east of Prince Rupert
Stumaun	Stumaun Creek	856	South east of Port Simpson
Wolf	Wolf Creek	1465	Port Edward

Source: MELP website: http://www.elp.gov.bc.ca/wat/cws/query/cws.htm

There is currently no ground water legislation in British Columbia. All ground water use, therefore, is unlicensed. However, the British Columbia government has given a high priority to enacting ground water legislation, which is expected in the very near future (McGonigal., pers. comm.).

4.9.1 Strategic planning issues related to water use

- ☐ Maintenance of natural stream flow regimes and water quality and quantity (for surface and ground water). These features are important for aquatic habitat as well as domestic and non-domestic water users.
- ☐ An LRMP can formally designate community watersheds under the Forest Practices Code.

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[29] Unrecorded water is the volume of water in a water body which is over and above the licensed volume.

[30] A community watershed is a drainage used to supply drinking water for a waterworks purpose (town or city water supply) or a domestic purpose in which 6 or more licensees have formed a group and requested community watershed status. The drainage area is to be not more than 500 km^2.

[31] A sixth community watershed within the North Coast Forest District (Axe Community watershed) is on Nisga'a land.

4.10 Roaded access

With its rugged terrain and so much of the landbase accessible from the water, road building in the North Coast area has been limited. There were approximately 935 km of forestry roads in the TSA as of 1996 (MOF, 1998). An estimated 53 km of new logging roads are built each year to accommodate the current harvest (MOF, 1994b). Mining operations are self-contained and, as long as they have access to tidewater, mines can operate without roads.

The topography of the area limits the options for road development. Road building is difficult and expensive. Most of the existing logging roads are roads that extend inland from the ocean and do not connect with main roads. Map 16 shows the distribution of main roads and logging roads throughout the plan area. As can be seen in Map 16, the one main travel route is Highway 16. Only three roads have been built off Highway 16. Two of these have been deactivated. The Lachmach Road remains open to a recreation site at Work Channel. Other notable roads or road networks include the following:

- A road connects the community of Lax Kw'alaams with Tuck Inlet, from which a ferry takes passengers to Prince Rupert.
- The Scotia River road network extends from the southern bank of the Skeena River to the Ecstall River. The road network is accessed by a private barge that crosses the Skeena River when operations are active in the Scotia River area.
- Another large network of roads (not linked to the Scotia River Road) extends from the other side of the Ecstall River to the coast.

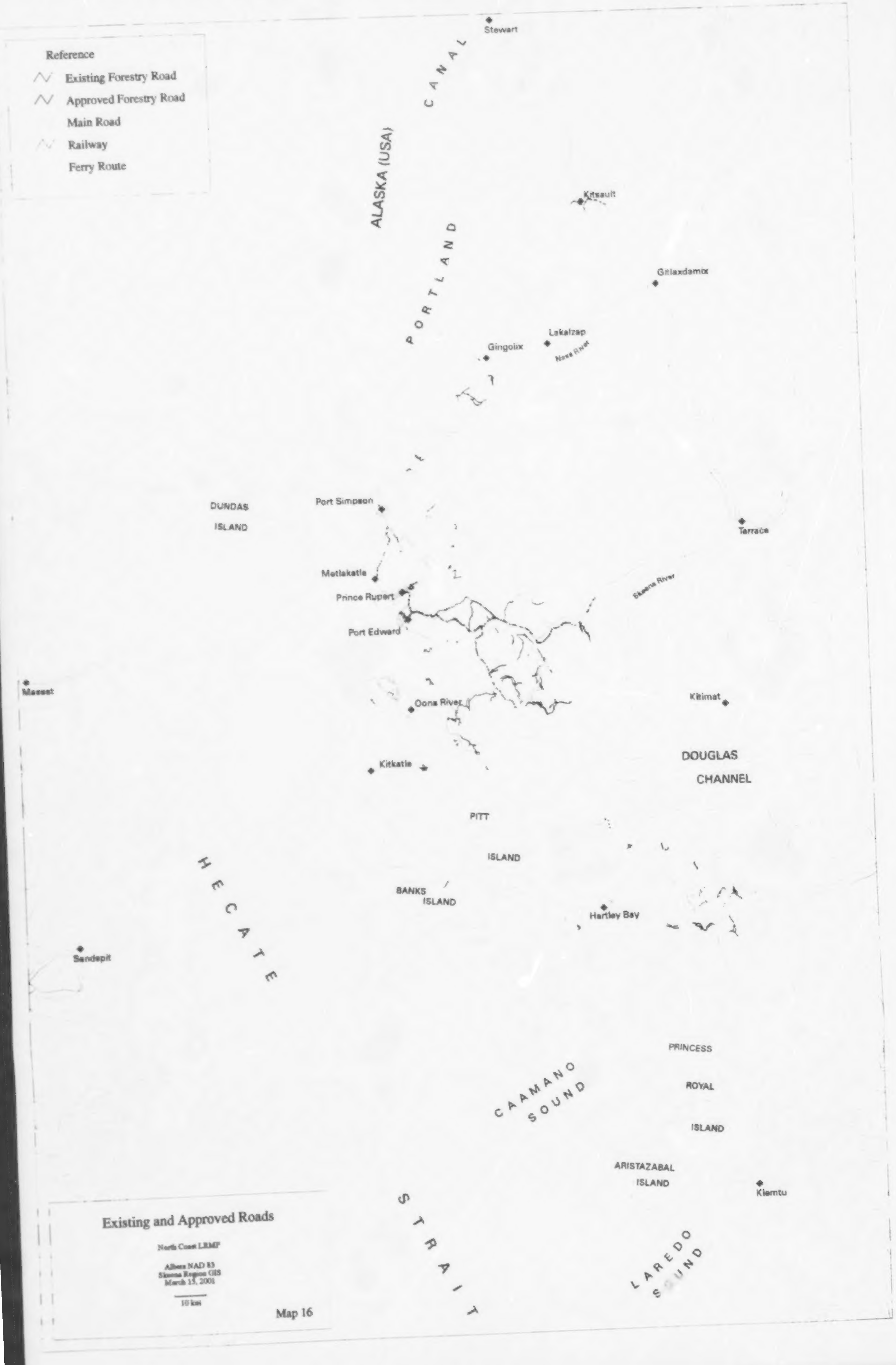
With the exception of the road leading into Kitsault, all of the secondary roads in the plan area are forestry-related. All mineral exploration activity has been helicopter supported in the past 10 years, resulting in no new road or skid trail development. Older mine trails have disappeared beneath the vigorous growth of shrubs and trees common to the plan area (Pardoe, pers comm).

One of the main concerns with road development is the potential environmental impact of road construction on the steep and potentially unstable terrain in the plan area. Road deactivation and restoration activities are primarily conducted to mitigate sedimentation into waterways and reduce the risk of road failure following harvesting and silvicultural operations. Under Forest Renewal British Columbia's Watershed Restoration Program, Watershed Assessment Procedures have been completed for areas throughout the district (Table 34). The assessments are based on information from existing cutblocks and roads, fish-bearing streams geology and terrain stability, and history of erosion or landslides. These assessments are used to identify priority watersheds for more detailed assessments and restoration work.

Table 34 shows watershed assessments in the North Coast planning area. It should be noted that the risk ratings shown in the table are not absolute and need to be considered in the context of the methodologies used for each assessment. All of the assessments completed to date will eventually be standardized using identical criteria (Sawchuk, pers. comm.). Forest Renewal BC has a state objective to restore 20% of the top priority watersheds in the TSA over the next five years (*Ibid.*). Prioritizing watersheds for restoration will be based on risk assessments as well as an assessment of the effectiveness of treatment given the funds available. For example, restoring a sensitive watershed where slope failure is just starting may be a more effective use of funds than spending a lot of money on a heavily damaged watershed where extensive erosion has already occurred.

Table 34. Results of risk assessments of hazard and consequence of slope failure for selected watersheds in the plan area.

Area	Risk (Hazard and Consequence of slope failure)		
	High	Moderate	Low
Alice Arm/ Portland Canal		Kitsault River	Donahue Ck/Maple Ck Marmot River
Khutzeymateen Inlet/ Steamer Passage		NE Somerville Island Steamer Passage	Kwinamass/ Mouse SW Khutzeymateen
Work Channel/ Skeena R Nth	Tuck/ Silver	Worsfold Bay Marion Creek McNeil/ Lachmach Ensheshese Quottoon/Thulme	
Skeena R Nth		Kwinitsa Creek	
Ecstall/ Skeena R Sth	Big Windsor	Scotia R Carthew Ck Hayward R Big Falls R Brown Lake	Snag Point Little Windsor
Porcher Island	Salt Lagoon East Side Cr Spiller R Humpback Ck		
Grenville Channel	Lagoon Basin		Moore Cover Baker Inlet
Kitkiata		Kitkiata Lake/ River	
Pitt Island Sth			Farrant Island Mitchall Cove
Gribbell Island/ Ursula Channel	Gribble Creek Riordan Creek McKay Reach	Bishop Bay Riordan Ck	Bishop Bay
Gardner Canal	Hotspring Cove Shearwater Kiltuish E Crab (Retro)		Kiltuish W Europa Sth



Existing and Approved Roads

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 15, 2001

Map 16

4.10.1 Strategic planning issues related to access

Opening up areas to roads may result in increased pressures on wildlife. Potential affects of increased access include:

- Direct habitat loss;
- Habitat displacement due to increased traffic and recreation;
- Collision mortality;
- Mortality sinks due to concentration of hunting effort;
- Mortality due to poaching; and
- Wildlife habitualization.

Roaded access is limited within the North Coast planning area. This fact lessens some of the concerns generally associated with wildlife and roads.

- Due to the topography of the plan area, roads are usually built along valley bottoms, which are also important habitat and movement corridors for wildlife.
- Grizzly bears and wolverines are sensitive to road access. Not only does development follow roads, but hunting and poaching also increase in roaded areas. Grizzly bear and wolverine populations decrease as human development encroaches on their habitat.
- Access to some lakes or streams may affect fish populations due to increased concentration of fishing effort.
- Roaded access to some recreational areas (e.g., lakes) may affect the aesthetic quality where the preference is for a remote recreational experience.
- Visual quality may be a concern since linear alterations, such as roads, can have severe and long-lasting visual impact.

5.0 PROTECTED AREAS

5.1 Existing protected areas

The North Coast LRMP area has both marine and terrestrial protected areas. Often the two environments are represented within a single protected area.

Eleven protected areas currently exist in the North Coast LRMP area (Table 35, Map 17). Four are ecological reserves, two are small roadside parks, three are marine parks set aside primarily as protected anchorages, and one is a sanctuary.

The Khutzeymateen Grizzly Bear Sanctuary is by far the largest of the existing protected areas, covering 44,902 ha. It is an intact watershed with high conservation values, containing a range of forested and non-forested habitats and high quality habitat for grizzly bears (RPAT, 1996). The recreation values are also high, with outstanding wildlife viewing opportunities that are managed in consideration of the primary conservation values, particularly grizzly bear management.

The ecological reserves at Dewdney and Glide Islands, Moore, McKenney and Whitmore Islands as well as the Byer, Conroy, Harvey and Sinnett Islands, combine land and marine environments. All the reserves have high conservation values. Moore, McKenney and Whitmore and Dewdney and Glide Islands host seabird colonies, rare plants and internationally significant coastal muskeg, while the other reserve contains habitat for the Red-listed Peale's peregrine falcon, seabird colonies and seal pupping.

The three small marine parks (Lowe Inlet, Klewnuggit Inlet and Union Passage) comprise the Inside Passage Marine Parks occur along the Grenville Channel. Conservation values are presumed low due to their small size; however, inventories to determine the specific conservation values have not yet occurred. The sites have a high recreational value for boaters and sailors requiring shelter and freshwater in a scenic setting (*Ibid.*).

Prudhomme Lake and Diana Lake are small parks located near Prince Rupert on Highway 16. Prudhomme Lake is a campground, while Diana Lake is a day-use area providing educational facilities and recreational opportunities including fishing (Price and Daust, 1999). The cultural and heritage values for the existing protected areas have not been fully identified (RPAT, 1995).

Table 35. Existing parks and protected areas within the North Coast LRMP area.

Park / Protected Area	Size (ha)	Ecosection	Comments
Khutzeymateen Park (Sanctuary)	44,902	Kitimat Ranges (KIR)	
Dewdney and Glide Islands Ecological Reserve # 25	3,845	Hecate Lowland (HEL)	
Byer, Conroy, Harvey, and Sinnett Islands E.R. #103	Land: 425; Marine: 11,780	HEL / QCS	Actually in QCS, but included with HEL for analysis by RPAT
Moore, McKenny, Whitmore Islands E.R. #23	73	HEL / QCS	Actually in QCS, but included with HEL for analysis by RPAT
Kitson Island Marine Park	Land: 20 Marine: 24.7	HEL	From 1996 Ecosystem Management Steering Committee Report
Inside Passage Marine Parks (3 areas)	Land: 2,962; Marine: 911	HEL	Lowe Inlet Marine Union Passage Marine Klewnuggit Inlet Marine
Gamble Creek E.R. #133	984	HEL	
Prudhomme Lake	7	HEL	Highway 16 campground
Diana Lake	233	HEL	Day-use site – Hwy. 16

Source: RPAT (1996); Price and Daust (1999); Protected Areas of BC Act.

5.2 Protected Areas Strategy study areas

British Columbia's existing protected areas system meets many of our conservation and recreation needs. However, it falls short of representing the full diversity of biological, natural, and cultural-heritage resource and recreational opportunities. Some areas, interests or values are not represented as well as others, and some are not represented at all. Even within some well-represented areas, existing protected areas tend to over-represent alpine ecosystems and under-represent mid and low elevation forested ecosystems.

The Province's Protected Areas Strategy reflects the move to a systematic approach to planning for new protected areas. The strategy aims to protect 12 percent of the province. The strategy also acknowledges that some regions may have more than 12 percent and some less, depending upon over-riding provincial objectives or existing land use commitments.

As part of a regionally based project, the North Coast Forest District was assessed for how well current protected areas represent the variety of ecosystems at a broad level, special features, cultural features and recreational uses in the area. This project, called a "Gap Analysis", identified a number of candidate sites, called study areas, with features or characteristics that may warrant protection (Table 36). This Protected Areas Strategy (PAS) gap analysis identified areas based upon two goals:

- ☐ Goal 1 (Representativeness): To protect viable, representative examples of the natural diversity of the province, representative of the major terrestrial, marine and freshwater ecosystems, the characteristic habitats, hydrology and land forms, and the characteristic backcountry recreational and cultural heritage values of each ecosection.
- ☐ Goal 2 (Special Features): To protect the special natural, cultural heritage and recreational features of the province, including rare and endangered species and critical habitats, outstanding or unique botanical, zoological, geological and paleontological features, outstanding cultural heritage features, and outstanding recreational features such as trails.

Table 36. Summary of the gap analysis by ecosection for the North Coast LRMP area.

Ecosection	**Area Currently Protected (ha)***		**Area currently protected in the North Coast LRMP area (ha)**		**Identified GAP (ha)**	**Proposed Goal 1 protected areas in the North Coast LMRP area**
	Land	Marine	Land	Marine		
APM	1,550	0	0	0	56,450	Pearse Island
KIR	641,800	0	46,000	0	Exceeds 12% target by 220,800	
HEL	57,000	95,000	7,000	22,700	120,700	Dundas Island, Stevens/Porcher Islands, Campania Island
DIE					Not analyzed by RPAT	
HES					Not analyzed by RPAT	Included in HEL
QCS					Not analyzed by RPAT	Included in HEL

* These areas consider the entire ecosection and do not include areas protected since 1995 in adjacent LRMPs.

** Prince Rupert Region only – Ecosection assigned to Prince George RPAT (RPAT, 1995)

A brief description of the Protected Area Strategy and details of the regional study area project can be found in two documents:

1) *Technical Gap Analysis Results Prince Rupert IAMC Region* prepared by the Prince Rupert Regional Protected Areas Team (RPAT), 1995; and
2) *Protected Areas Strategy for British Columbia: The Prince Rupert Region PAS Report*, RPAT, (1996).

The PAS report (RPAT, 1996) identified four Goal 1 (Table 37) and 55 Goal 2 study areas (Appendix 3) within the North Coast LRMP area. In 1997, the BC Cabinet approved these study areas (Map 17). Should an LRMP start in the North Coast planning area, the LRMP table will have the opportunity to choose which, if any, of the Study Areas will be protected. A planning table will also have the option of proposing additional protected areas.

Any marine protected areas recommended by the planning table may be considered in subsequent integrated coastal planning to be designated under the Marine Protected Areas Strategy, a joint provincial and federal initiative whose goal is to develop a comprehensive system of marine protected areas (DFO & LUCO, 1998).

Table 37. Goal 1 PAS study areas within the North Coast LRMP area.

Study Area	Ecosection	Size (ha)	Conservation Rating	Recreation Rating	Cultural / Heritage Rating
Pearse Island	APM	11,000	V. High	Medium	Information to be collected
Dundas Island	HEL	Land: 21,300 Marine: 36,300	V. High	High – V. High	Seasonal village sites, resource harvesting
Stevens/ Porcher Islands	HEL	Land: 16,300 Marine: 40,000	V. High	High	Native fishing & gathering.
Campania	HEL	Land: 17,700 Marine: 10,000	High	High	Heritage, fishing, & gathering

Source: RPAT (1996)

The *Pearse Island Goal 1 Study Area* encompasses 11,000 ha of the Alaskan Panhandle Mountains ecosection. It contains intact watersheds of coastal temperate rainforest with a very high conservation value. This area helps fill the gap in representation of Coastal Western Hemlock very wet hypermaritime (CWHvh2) ecosystems. The area provides moderate recreational values for recreational boating and ocean fishing. A unique historical site, in the form of a historic nationally significant US block house, is located within the study area (RPAT 1996; 1995).

The remaining three Goal 1 study areas are located within the Hecate Lowland ecosection. All have marine and terrestrial components. *Dundas Island Study Area*, containing numerous islands north west of Prince Rupert, is the largest of the study areas with a total area of 57,600 ha. The area's very high conservation values include rocky islets for Red- and Blue-listed seabirds, coastal muskeg forest, kelp beds, shallow reefs and bays used for feeding, and sea lion haul outs. Recreational values are high to very high due to the remote location and beaches, and the boating, fishing, sea kayaking and wildlife viewing opportunities. The islands contain culturally important seasonal village sites where resource harvesting occurred (RPAT 1996; 1995).

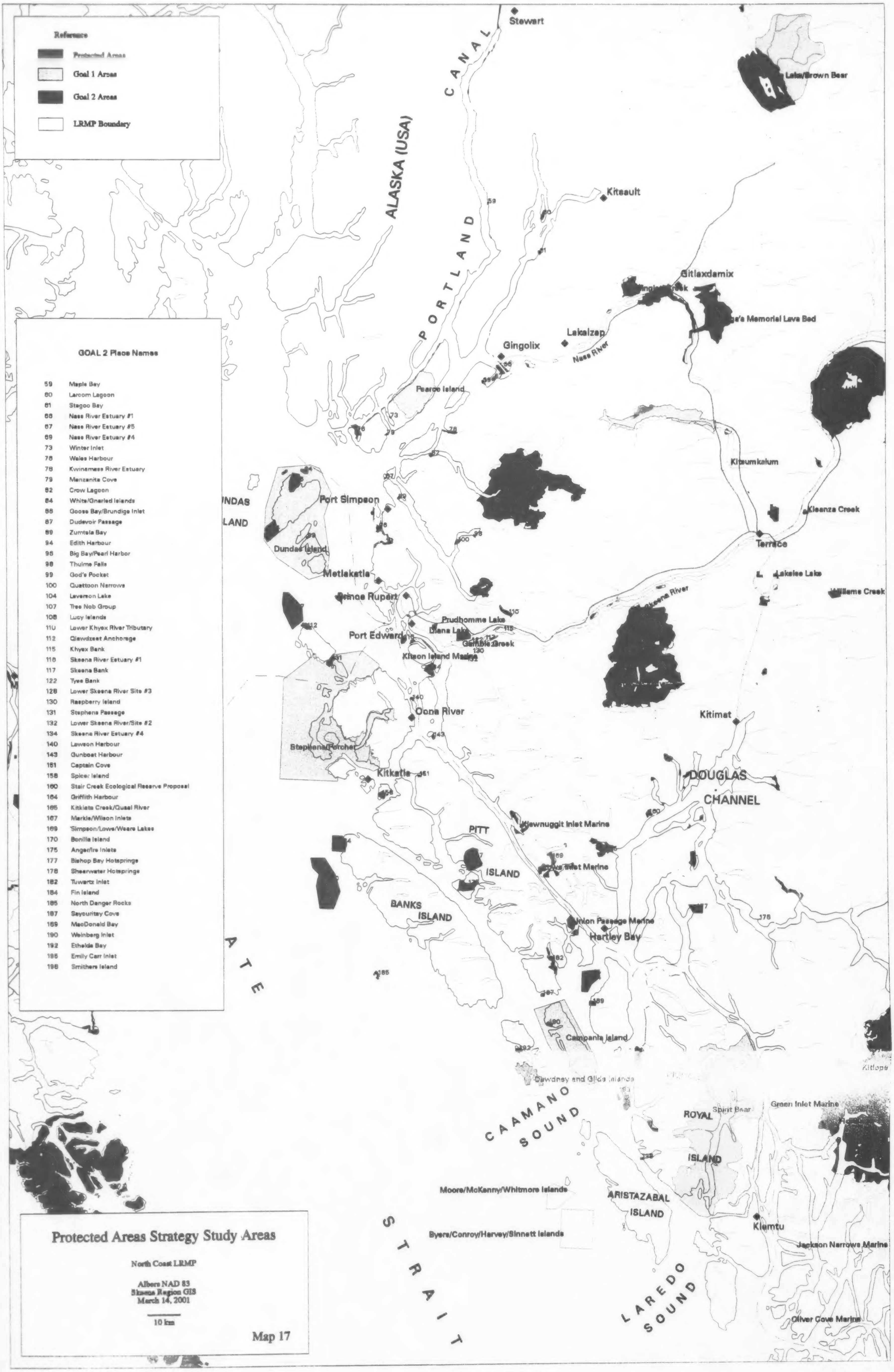
Also contained in the underrepresented Hecate Lowland ecosection is the *Stevens / Porcher Islands Study Area*, located south east of Prince Rupert, primarily on the east and northern sides of Porcher Island. Seventy-one percent of this study area is marine, reflecting the high marine values in the area. These include large protected marine inlets, herring spawning grounds, salmonid habitat; important wetlands for Red- and Blue- listed waterfowl, gray whale use of Oval Bay and good wildlife viewing opportunities. Upland are coastal muskeg forests. Historically, First Nations have used the area for fishing and gathering (RPAT 1996; 1995).

The final Goal 1 study area is the 27,700 ha *Campania Island Study Area,* at the southern end of the planning area. Campania Island in its entirety and the associated surrounding marine environment will help maintain the intact island ecosystem. Conservation and recreation values are high. The area contains lowland coastal muskeg, extensive kelp beds, rare marine algae (*Codium ritteri*), sheltered inlets, warm upland lakes and remote sand beaches. Hiking, kayaking and wildlife viewing contribute to the recreational value of the area.

The goal 2 areas have numerous values including ecological, historical or cultural significance and provide recreational opportunities (boat anchorages or havens, scenery, hiking, kayaking, fishing camping and other wilderness experiences). Values and attributes of each goal 2 study area are summarized in Appendix 3.)

5.3 Strategic planning issues related to protected areas

☐ As part of its mandate, the LRMP table will make recommendations on areas to be designated as protected areas. The planning table may also recommend the types of uses allowed within individual protected areas.



GOAL 2 Place Names

59	Maple Bay
60	Larcom Lagoon
61	Stagoo Bay
66	Nass River Estuary #1
67	Nass River Estuary #5
69	Nass River Estuary #4
73	Winter Inlet
76	Wales Harbour
78	Kwinamass River Estuary
79	Manzanita Cove
82	Crow Lagoon
84	White/Gnarled Islands
86	Goose Bay/Brundige Inlet
87	Dudevoir Passage
89	Zumtela Bay
94	Edith Harbour
96	Big Bay/Pearl Harbor
98	Thulme Falls
99	God's Pocket
100	Quattoon Narrows
104	Leverson Lake
107	Tree Nob Group
108	Lucy Islands
110	Lower Khyex River Tributary
112	Qlawdzeet Anchorage
115	Khyex Bank
116	Skeena River Estuary #1
117	Skeena Bank
122	Tyee Bank
128	Lower Skeena River Site #3
130	Raspberry Island
131	Stephens Passage
132	Lower Skeena River/Site #2
134	Skeena River Estuary #4
140	Lawson Harbour
143	Gunboat Harbour
151	Captain Cove
158	Spicer Island
160	Stair Creek Ecological Reserve Proposal
164	Griffith Harbour
166	Kitkiata Creek/Quaal River
167	Markle/Wilson Inlets
169	Simpson/Lowe/Weare Lakes
170	Bonilla Island
175	Anger/Ire Inlets
177	Bishop Bay Hotsprings
178	Shearwater Hotsprings
182	Tuwartz Inlet
184	Fin Island
185	North Danger Rocks
187	Sayouritay Cove
189	MacDonald Bay
190	Weinberg Inlet
192	Ethelda Bay
195	Emily Carr Inlet
198	Smithers Island

Protected Areas Strategy Study Areas

North Coast LRMP

Albers NAD 83
Skeena Region GIS
March 14, 2001

Map 17

6.0 HISTORY OF PLANNING IN THE NORTH COAST

There are no existing strategic plans that currently guide resource management in the North Coast.

In 1989, MOF released the "Inside Passage Draft Strategic Plan" for public review. At the time of the announcement, the plan called for a number of actions to manage the Inside Passage for its scenic and recreation values as well as timber values. These included the establishment of a chain of marine parks and timber harvesting to maintain scenic and recreational values. The intention was for a local resource use plan (LRUP) to commence once the strategic plan was signed off, as well as the designation of marine parks. No LRUP was done, however marine parks have been designated along the Inside Passage and the area has been made known as a scenic area under the Forest Practices Code.

The Khutzeymateen project was undertaken in 1988 by the Minister of Forests and the Minister of Environment, Lands and Parks to determine the impact of timber harvesting in the area on grizzly bears and their habitat. The Khutzeymateen project consisted of a number of concurrent initiatives: a timber inventory, a road-engineering study, the classification and mapping of ecosystems and terrain, a fisheries study and a grizzly bear study. The Khutzeymateen steering and management committees concluded that timber harvesting in the Khutzeymateen would result in unacceptable impacts on grizzly bears. The Khutzeymateen Park was established in 1994 as Canada's only grizzly bear sanctuary.

The Central Coast Land and Coastal Resource Management Planning process (CCLCRMP) is currently underway. The CCLCRMP area covers 5.7 million hectares of coastal B.C. from Butte Inlet to Princess Royal Island. The plan area includes portions of the North Coast TSA and Block 5 of TFL 25, which is administered by North Coast Forest District. The issues being addressed in the CCLCRMP are very similar to those that will be addressed in the North Coast LRMP.

Integrated coastal zone management is an initiative of the Department of Fisheries and Oceans under the *Oceans Act* to move toward integrated management of coastal, estuarine and marine environments. The Integrated Coastal Zone Management (ICZM) process strives to produce a plan from which to manage ocean and coastal resources, all activities affecting estuarine, coastal and marine environments and to coordinate the efforts of stakeholders and regulators in these areas. The process will follow a model of community-based decision-making that is inclusive of governments, First Nations, stakeholder and the general public. The goal is to reach general agreement the best blend of conservation, sustainable resource use and economic development for coastal areas. The ICZM process for the Pacific coast of British Columbia is still in its developmental stages.

7.0 PROVINCIAL GOVERNMENT AGENCIES AND THEIR MANDATES

There are a number of provincial agencies with responsibilities relating to resources management and land use. Although each agency is an advocate for their mandate, they also balance their advocated interests with overall provincial goals and objectives.

The larger agencies have three levels of administration: headquarters (Victoria), regional, and district or field offices. Headquarters generally house the executive and top managers, develop policy and budgets, co-ordinate administrative functions, develop research and provincial planning functions, and oversee programs to ensure provincial goals and priorities are carried out. Regional offices provide the link between delivering provincial goals and priorities and managing the more particular needs of each region of the province. Many of the functions such as planning, administration, management, and research are housed in regional offices. The District offices provide the front line services, ensuring that activities at the operational level are managed in accordance with the agencies mandate. There are extensive, regular reviews, consultations, and communications between these different offices.

Ministry of Forests

The Ministry of Forests is responsible for the management of the timber, range and recreation resources of Crown forestland. The Ministry manages the land for a variety of uses, administering programs in timber harvesting, silviculture, access planning and road engineering, protection (fire management), recreation, visual landscape management, forage, and wildlife. The Ministry works with other agencies in order to manage forestry activities in consideration of other resource values e.g., water quality, fisheries, wildlife, culture and heritage resources, and energy and minerals. The North Coast Forest District is based out of Prince Rupert and is part of the Prince Rupert Forest Region.

As well, the agency is involved in numerous levels of consultation and planning with other government agencies and stakeholders and First Nations.

Ministry of Environment, Lands and Parks

The Ministry of Environment, Lands and Parks is made up of three branches:

- ☐ The mandate of BC *Environment* includes the management of harvesting of species (hunting and fishing regulations), enforcement (Conservation Officer Service), protection of species (rare and threatened species protection, biodiversity, habitat protection), research and inventory work, and water and air quality management. Most BC Environment activity occurs out of the regional office in Smithers. There is one BC Environment staff position working out of the North Coast Forest District office, whose mandate is to promote the consideration and management of environmental values (particularly fish and wildlife populations, habitat and biodiversity) in forest development plans.

- ☐ In 1998, the Ministry of Environment, Lands and Parks delegated the management of Crown land tenures to the Crown Corporation known as BCAL. This delegation expanded the corporation's original mandate of marketing and selling Crown assets into the tenuring and general management of Crown lands. BCAL accepts applications for Crown land tenures, refers these applications to other agencies for comment, and then makes a decision as to whether or not the tenure should be offered. In addition to awarding new tenures, BCAL staff are also responsible for monitoring established tenures for compliance with license provisions, monitoring and responding to trespass issues on Crown land, and responding to general public inquiries.

- BC Parks, Skeena District, is administered from the Smithers parks office with an area office in Terrace where day to day management of the North Coast protected areas occur. BC Parks mission statement is "To protect natural diversity and natural and cultural features in provincial parks and ecological reserves and to provide opportunities for outdoor recreation in parks." As stewards of the provincial parks system, BC Parks is responsible for planning and managing protected areas and their natural and cultural features. Associated with this, the agency manages recreation activities, including facility operations contracts for campgrounds, public education and awareness, and resource management for each park and ecological reserve. BC Parks is also a lead agency involved with the province's Protected Areas Strategy, along with Ministry of Forests, BC Environment, and Ministry of Energy and Mines.

Ministry of Energy and Mines

The Ministry of Energy and Mines manages the province's energy and mineral resources for the maximum benefit of British Columbians, and implements policies and programs to encourage their development while maintaining environmental integrity. In addition, the Ministry regulates and inspects the exploration for and the development of mineral, oil, gas and geothermal resources, to protect the workers, the public and the environment.

There are several divisions within the ministry, including the Mineral Division, which oversees mineral development, and the Energy Division, which oversees oil, gas and geothermal development. Within these divisions, the ministry is further divided into branches dealing with tenure, permitting and regulation, research initiatives, etc. The Energy Division has offices in Victoria and Ft. St. John, whereas the Mineral Division has offices in Victoria, Vancouver and five regional offices.

The northwest regional Mines Branch office is located in Smithers. This office regulates all mining operations (including aggregate pits, placer operations and major metal mines) and applicable mineral exploration under the Mines Act. Additionally, the office tracks regional exploration activity, maintains a resource library and participates in regional land use planning. All mineral tenure is administered through the Mineral Tenure Branch, located in Victoria and Vancouver, with tenure recording facilities available at the Government Agent Office in both Houston and Smithers. Tenure for construction aggregate is administered through the B.C. Asset and Lands Corp.

Ministry of Small Business, Tourism and Culture

Tourism is managed under the Ministry of Small Business, Tourism and Culture and its office is in Victoria. The Tourism Branch is primarily interested in supporting growth in the tourism industry through inventory work, marketing and promotion strategies, and consulting with key stakeholders. The Archaeology and Heritage Branches are involved in inventorying and protecting cultural heritage resources.

The Ministry of Small Business, Tourism and Culture is conducting tourism opportunity studies around the province and has initiated the Gateway Community Development Planning program to support development of opportunities for ecotourism and adventure travel in communities.

Ministry of Agriculture and Food

The Ministry of Agriculture and Food provides extension services and support to the local agricultural industry. Extension and support services include land use practices and business management skill development. The local agriculture industry is able to access expertise from across the province through the Smithers office. Currently the Smithers office delivers the Grazing Enhancement Fund initiative in the region.

Ministry of Fisheries

The new Ministry of Fisheries was established in February 1998. The Ministry leads government's efforts to address a priority to renew B.C.'s fisheries. The Ministry reflects the changing dynamics and challenges affecting B.C.'s fish resources and fisheries, including: the need to protect fish and fish habitat from expanding urban and industrial development; the effects of federal restructuring in the commercial fishing industry; the growing economic importance of recreational fishing; the growth of aquaculture; the need to develop new, value-added industries from fisheries resources, and; the demand for greater public involvement and accountability in fisheries management decisions. Its office is located in Victoria. The federal Department of Fisheries and Oceans still has the mandate to set quotas and allocate and regulate the marine fish harvest.

Other provincial and federal agencies

Other agencies such as, the Ministry of Transportation and Highways, the Ministry of Aboriginal Affairs, and federal agencies are consulted as needed, depending on the land use issue. Since there can be links between provincial land use planning and the BC Treaty Process or other negotiations with First Nations, the Ministry of Aboriginal Affairs keeps in close contact with planning initiatives.

Land use planning requires coordinating all of the various agencies with a relevant mandate. The Land Use Coordination Office (LUCO) was established as a separate body to act as a "central agency for government land-use planning." The mandate of LUCO is to oversee strategic level land use planning (Land and Resource Management Planning) and deliver the province's Protected Areas Strategy. Some of the key roles of LUCO are to ensure public participation in land use planning initiatives, to facilitate land use decisions, to coordinate inter-ministry programs, and to ensure that land use plans are closely coordinated with social and economic considerations. Its office is in Victoria. Interagency Management Committees (IAMCs) have been established to manage delivery of land use plans at the regional level. The Prince Rupert IAMC is based out of Smithers. The IAMC is made up of senior managers from each of the resource agencies. The IAMC oversees the delivery of the land use planning program and the protected areas strategy for their particular region. Each agency assigns staff to work on these initiatives and these people form Interagency Planning Teams (IPTs). The position of IAMC Chair revolves every one to three years within the IAMC membership.

Fisheries and Oceans Canada (DFO) is responsible for policies and programs in support of Canada's economic, ecological and scientific interests in oceans and inland waters; for the conservation and sustainable utilization of Canada's fisheries resources in marine and inland waters, for leading and facilitating federal policies and programs on oceans, and for safe, effective and environmentally sound marine services, responsive to the needs of Canadians in a global economy.

Table 38: Provincial legislation relevant to strategic land use planning.

Ministry	Relevant Legislation	Offices
Ministry of Forests	*Forest Act* *Forest Practices Code of B.C. Act* *Forest Land Reserve Act* *Forest Renewal Act* *Forest Stand Management Fund Act* *Foresters Act* *Litter Act* *Range Act*	• North Coast Forest District 125 Market Place Prince Rupert V8J 1B9 • Prince Rupert Forest Region 3726 Alfred Street Bag 5000 Smithers V0J 2N0
Ministry of Environment, Lands and Parks: BC Environment	*Environment Management Act* *Forest Practices Code Act* *Migratory Birds Convention Act* *Waste Management Act* *Federal Fisheries Act* *Litter Act* *Environmental Assessment Act* *Fish Protection Act* *Greenbelt Act* *Motor Vehicle (All Terrain) Act* *Pesticide Control Act* *Water Act* *Water Protection Act* *Water Utility Act* *Weather Modification Act* *Wildlife Act*	• BC Environment Skeena Regional Office 3726 Alfred Street Smithers V0J 2N0
Ministry of Environment, Lands and Parks: BC Lands	*Land Act* *Land Survey Act* *Land Surveyors Act* *Land Title Act*	• BC Lands Skeena Regional Office 3726 Alfred Street Smithers V0J 2N0
Ministry of Environment, Lands and Parks: BC Parks	*Protected Areas of British Columbia Act* *Park Act* *Ecological Reserves Act*	• BC Parks Skeena District 3790 Alfred Street Smithers V0J 2N0

Ministry	Relevant Legislation	Offices
	Environment and Land Use Act *Wildlife Act* *Litter Act* *Motor Vehicle (All Terrain) Act*	
Ministry of Energy and Mines	*Geothermal Resources Act* *Mineral Land Tax Act* *Mineral Tax Act* *Mineral Tenure Act* *Mines Act* *Mining Tax Act* *Mining Right of Way Act* *Mining Rights Amendment Act* *Petroleum and Natural Gas Act*	• Northwest Regional Office 3793 Alfred Street Smithers V0J 2N0
Ministry of Fisheries	*Animal Disease Control Act* *Farm Practices Protection Act* *Farming and Fishing Industries Act* *Fish Inspection Act* *Fish Protection Act* *Fisheries Act* *Fisheries Renewal Act*	• Ministry of Fisheries 780 Blanshard Street PO Box 9359 Stn. Provincial Government Victoria, BC V8W 9M2
Ministry of Small Business, Tourism and Culture: Tourism Branch	*Tourism Act* *Tourism BC Act*	• BC Tourism Box 9800 Stn. Provincial Government Victoria V8W 9W1

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APPENDIX 1: RARE AND ENDANGERED PLANT AND ANIMALS SPECIES

B.C. Conservation Data Centre: Rare Vertebrate Animal Tracking List

North Coast Forest District

June 2000

Scientific name	COMMON NAME	Global Rank	Prov. Rank	Prov. List
Lampreys				
Freshwater Fish				
Salvelinus confluentus	Bull Trout	G3	S3	Blue
Amphibians				
Ascaphus truei population 2	Tailed Frog, coastal population	G4T4Q	S3S4	Blue
Reptiles				
Birds				
Phalacrocorax pelagicus pelagicus	Pelagic Cormorant, *pelagicus* subspecies	G5TU	S2B,SZN	Red
Ardea herodias fannini	Great Blue Heron, *fannini* subspecies	G5T4	S3B, S5N	Blue
Cygnus buccinator	Trumpeter Swan	G4	S3S4B,S4N	Blue
Branta bernicla	Brant	G5	S3N	Yellow
Histrionicus histrionicus	Harlequin Duck	G4	S3N,S4B	Yellow
Melanitta perspicillata	Surf Scoter	G5	S3B,S4N	Blue
Haliaeetus leucocephalus	Bald Eagle	G4	S4	Yellow
Accipiter gentilis laingi	Northern Goshawk, *laingi* subspecies	G5T2	S2B,SZN	Red
Falco peregrinus pealei	Peregrine Falcon, *pealei* subspecies	G4T3	S3B,SZN	Blue
Falco rusticolus	Gyrfalcon	G5	S3?B,SZN	Blue
Grus canadensis	Sandhill Crane	G5	S3B,SZN	Blue
Brachyramphus marmoratus	Marbled Murrelet	G3G4	S2B,SZN	Red
Synthliboramphus antiquus	Ancient Murrelet	G4	S3B,SZN	Blue
Ptychoramphus aleuticus	Cassin's Auklet	G4	S3B,SZN	Blue
Cerorhinca monocerata	Rhinoceros Auklet	G5	S4B,SZN	Yellow
Fratercula cirrhata	Tufted Puffin	G5	S3B,SZN	Blue
Fratercula corniculata	Horned Puffin	G5	S2B,SZN	Red
Asio flammeus	Short-Eared Owl	G5	S2N,S3B	Blue
Pinicola enucleator carlottae	Pine Grosbeak, *carlottae* subspecies	G5T3	S3B,SZN	Blue

Mammals

Myotis keenii	Keen's Long-Eared Myotis	G2G3	S1S3	Red
Orcinus orca population 1	Killer Whale (Northeast Pacific resident population)	G4G5T3Q	S3	Blue
Orcinus orca population 2	Killer Whale (Northeast Pacific offshore population)	G4G5TUQ	S3	Blue
Orcinus orca population 3	Killer Whale (West Coast transient population)	G4G5T4Q	S3	Blue
Eschrichtius robustus	Gray Whale	G3G4	S2N	Blue
Megaptera novaeangliae	Humpback Whale	G3	S1N	Blue
Ursus arctos	Grizzly Bear	G4	S3	Blue
Eumetopias jubatus	Northern Sea Lion	G3	S2B,S3N	Red
Martes pennanti	Fisher	G5	S3	Blue
Gulo gulo luscus	Wolverine, *luscus* subspecies	G4T4	S3	Blue

31 Taxa Listed

B.C. Conservation Data Centre:Rare Vascular Plant Tracking List

North Coast Forest District

May 2000

Scientific name	Common name	Global Rank	Prov. Rank	Prov. List
Agrostis pallens	Dune bentgrass	G4G5	S2S3	Blue
Arnica chamissonis ssp. *incana*	Meadow arnica	G5T?	S2S3	Blue
Aster ascendens	Long-leaved aster	G5	S2S3	Blue
Calamagrostis montanensis	Plains reedgrass	G5	S1	Red
Callitriche heterophylla ssp. *heterophylla*	Two-edged water-starwort	G5T5	S2S3	Blue
Caltha palustris var. *palustris*	Yellow marsh-marigold	G5T?	S2S3	Blue
Carex glareosa var. *amphigena*	Lesser saltmarsh sedge	G4G5T?	S2S3	Blue
Carex gmelinii	Gmelin's sedge	G4G5	S2S3	Blue
Cornus suecica	Dwarf bog bunchberry	G5	S2S3	Blue
Eleocharis kamtschatica	Kamtschatica spike-rush	G4	S2S3	Blue
Enemion savilei	Queen Charlotte isopyrum	G3	S3	Blue
Hippuris tetraphylla	Four-leaved mare's-tail	G5	S2S3	Blue
Juncus arcticus ssp. *alaskanus*	Arctic rush	G5T?	S2S3	Blue
Juncus stygius	Bog rush	G5	S2S3	Blue
Leucanthemum arcticum	Arctic daisy	G5	SH	Red
Ligusticum calderi	Calder's lovage	G3	S3	Blue
Lilaea scilloides	Flowering quillwort	G5?	S2S3	Blue
Malaxis paludosa	Bog adder's-mouth orchid	G4	S2S3	Blue
Polystichum setigerum	Alaska holly fern	G2G3	S2S3	Blue
Sanguisorba menziesii	Menzies' burnet	G3G4	S2S3	Blue
Senecio moresbiensis	Queen Charlotte butterweed	G3	S3	Blue
Triglochin concinnum var. *concinnum*	Graceful arrow-grass	G5T?	S2	Red

22 Taxa Listed

The natural plant community tracking list is incomplete since there is not yet enough data available for the CDC to rank all of the rare natural plant communities in B.C. This applies especially to many wetland, alpine, and grassland plant communities. This year, the Ministry of Forests will be classifying grassland and wetland plant communities throughout B.C., and this will enable the CDC to produce a more comprehensive natural plant community tracking list. In preparation for this, the rarity ranks of those wetland and grassland plant communities already on the tracking list have the "Q" modifier (e.g. S2Q) to indicate that their classification is about to change. Their names and ranks will be updated after the classification is completed. Until then, they will be retained on "interim" red and blue lists to indicate that there are conservation concerns for these plant communities which will probably also apply to the corresponding plant communities in the new classification.

Please note that all ranks reflect the rarity of plant community occurrences that have not been disturbed by humans or domestic animals, and are in a natural or "climax" state. Do not confuse these natural plant communities with successional plant communities (e.g. second-growth Douglas-fir and salal forests), or with degraded plant communities (e.g. a weedy bluebunch wheatgrass and junegrass grassland). However, be aware that for the purposes of conservation, disturbed occurrences of rare plant communities may be ecologically valuable if there are few or no natural, undisturbed occurrences left in the Province (e.g. Garry Oak plant communities). Please visit the CDC's Ecology web page (www.elp.gov.bc.ca/rib/wis/cdc/ecology.htm) or contact the CDC for more information on rare natural plant communities and rare natural plant community conservation.

Scientific name	**Common name**	**Biogeoclimatic Ecosystem Classification Unit(s)**	**Provincial Rank**	**Provincial List**	**Successional Status**	**Structural Stage**
Abies amabilis - Picea sitchensis / Oplopanax horridus	Amabilis fir - Sitka spruce / devil's club	CWHvm1/08 CWHvm2/08	S3	Blue	EC	7
Picea sitchensis / Calamagrostis nutkaensis	Sitka spruce / reedgrass	CWHvh2/16	S3	Blue	DC	7
Picea sitchensis / Carex obnupta	Sitka spruce / slough sedge	CWHvh2/18	S3	Blue	EC	7
Picea sitchensis / Kindbergia oregana	Sitka spruce / kindbergia	CWHvh2/15	S3	Blue	EC	7
Picea sitchensis / Maianthemum dilatatum Wet Hypermaritime 1	Sitka spruce / false lily-of-the-valley Wet Hypermaritime 1	CWHvh2/08	S2	Red	EC DC	7
Picea sitchensis / Malus fusca	Sitka spruce / Pacific crabapple	CWHvh2/19	S3	Blue	EC DC	7
Picea sitchensis / Polystichum munitum	Sitka spruce / sword fern	CWHvh2/17	S3	Blue	DC	7
Picea sitchensis / Rubus spectabilis Very Wet Maritime	Sitka spruce / salmonberry Very Wet Maritime	CWHvm1/09	S2	Red	EC DC	7
Picea sitchensis / Trisetum cernuum	Sitka spruce / trisetum	CWHvh2/09	S2	Red	EC DC	7
Populus balsamifera ssp. *trichocarpa / Cornus stolonifera*	Black cottonwood / red-osier dogwood	CWHvm1/10 CWHwm/06* CWHws1/08* CWHws2/08*	S3	Blue	EC DC	6
Thuja plicata - Picea sitchensis / Oplopanax horridus Very Wet Hypermaritime 2	Western redcedar - Sitka spruce / devil's club Very Wet Hypermaritime 2	CWHvh2/07	S3	Blue	CC	7
Thuja plicata - Picea sitchensis / Polystichum munitum	Western redcedar - Sitka spruce / sword fern	CWHvh2/05	S2S3	Blue	CC	7
Thuja plicata - Tsuga heterophylla / Polystichum munitum	Western redcedar - western hemlock / sword fern	CWHvm1/04	S3?	Blue	CC	7

B.C. Conservation Data Centre: Rare Natural Plant Community Tracking List

North Coast Forest District

May 2000

13 Natural Plant Communities Listed

Biogeoclimatic Ecosystem Classification (BEC) Unit(s): This column gives the BEC unit(s) in which each plant community can occur. These units are described in the Ministry of Forests' "Field Guide to Site Identification and Interpretation" for the appropriate Forest Region. Please note that the BEC units listed are for the entire Forest Region, and may not all occur in this Forest District. Units numbered "00" have not yet been assigned site series numbers by the Ministry of Forests. Site series are NOT equivalent to natural plant communities as defined by the CDC; visit the CDC's Ecology web page (www.elp.gov.bc.ca/rib/wis/cdc/ecology.htm) for an explanation.

Successional Status: This column indicates the successional status of each natural plant community. Natural plant communities are, almost without exception, climax plant communities. Younger successional stages are considered to be different plant communities, though they may eventually develop into climax plant communities. For more information on successional status, visit the CDC's Ecology web page (www.elp.gov.bc.ca/rib/wis/cdc/ecology.htm) or consult the Field Manual for Describing Terrestrial Ecosystems (www.for.gov.bc.ca/RIC/Pubs/teEcolo/fmdte/deif.htm).

Code	Successional Status	Definition
CC	Climatic climax	The oldest expression of an ecosystem, where succession has been unimpeded by edaphic (site) limiting factors or ecological disturbance. This state is self-perpetuating in the absence of disturbance.
ED	Edaphic climax	The oldest possible expression of an ecosystem given edaphic (site) limiting factors atypical for the landscape which arrest or redirect succession so that the climatic climax is never achieved. Edaphic limiting factors include extremely dry soil, extremely wet soil, and very poor nutrient regime, relative to the landscape norms.
DC	Disclimax	The oldest possible expression of an ecosystem given a natural disturbance regime which arrests or redirects succession so that the climatic climax is never achieved. Natural disturbances include periodic surface fires and annual flooding.

Structural Stage: This column indicates the structural stage(s) of each natural plant community. Similar plant communities at younger structural stages are considered to be different plant communities, though they may eventually develop into natural plant communities. For definitions, see the Field Manual for Describing Terrestrial Ecosystems (www.for.gov.bc.ca/RIC/Pubs/teEcolo/fmdte/deif.htm).

Code	Structural Stage	Code	Structural Stage
1	Sparse/bryoid	3	Shrub/Herb
1a	*Sparse*	*3a*	*Low shrub*
1b	*Bryoid*	*3b*	*Tall shrub*
2	Herb	4	Pole/Sapling
2a	*Forb-dominated*	5	Young Forest
2b	*Graminoid-dominated*	6	Mature Forest
2c	*Aquatic*	7	Old Forest
2d	*Dwarf shrub-dominated*		

APPENDIX 2: GEOLOGY OF THE NORTH COAST

Bedrock Geology

The North Coast plan area, excluding the upper reaches of Portland Canal and Observatory Inlet, is dominantly underlain by granite and metamorphic rocks. The granite rocks formed 50 to 100 million years ago, as numerous individual bodies, 25 to 30 kilometres below the surface of the Earth. The metamorphic rocks are former sedimentary and volcanic rocks, transformed by very high temperatures and pressures resulting from the deep burial and formation of the granite. Plate tectonics pushed the granite and metamorphic rocks up at a rate of 2 mm per year, requiring about 30 million years to reach their present elevation above sea level. Erosion of the rising mountain range shed sand and silt into Hecate Strait and carved the rugged and high relief Coastal Mountain Range we know today.

This event was one of the final stages in evolution of the western margin of North America. It was the result of the Pacific plate, carrying the Insular geologic belt, colliding with the North American plate. Subduction of oceanic portions of the Pacific plate beneath ancestral North America occurred until continental crust, represented by Vancouver Island, Queen Charlotte Islands/Haida Gwaii and southeast Alaska, reached the continent. This light continental crust was at first drawn down the subduction zone, but proved to be too low in density to be forced under the North American plate and rose up, becoming the Coast Range geologic belt of granite and metamorphic rocks.

The upper reaches of Portland Canal and Observatory Inlet lie along the eastern boundary of the Coast Range geologic belt, and are underlain by rocks of completely different affinity from the rest of the North Coast District. Prior to collision of the Insular belt, volcanic islands formed off the west coast of ancestral North America. These volcanic and sedimentary rocks are part of the extensive Bowser Lake and Hazelton Groups of north central B.C., and are preserved in the Anyox, Georgie River, Alice Arm and Kitsault River areas of the North Coast. The strong mining history of these areas reflects the prolific mineralization found in the Hazelton Group rocks.

Metamorphic rocks on the North Coast are sedimentary and volcanic rocks that were transformed by very high temperature and pressure, which occurred during formation of the granite. Sandstone, shale and limestone were converted to quartzite, gneiss and marble, and some of the sedimentary and volcanic rocks were heated to their melting point. Rocks that melted were able to ooze upward, as diapirs, and then cooled and solidified, forming the innumerable bodies of granite in the Coast Range. Fossils in the sedimentary rocks, from which the age and water depth could be determined, and sedimentary features, such as ripple marks and other clues to depositional environment, were obliterated by the recrystallization of minerals which occurs during metamorphism. New scientific methods continue to probe through the mask of metamorphism, to understand the ultimate origin of the metamorphic rocks, but many aspects of their early history will remain shrouded in mystery. Continuing investigation of this question is important in evaluating the mineral potential of these metamorphic rocks.

Metamorphic rocks on the North Coast are correlated with sedimentary and volcanic rocks in southeast Alaska (the Alaskan panhandle), the St. Elias region of Yukon and far northwestern British Columbia. There, these strata are not metamorphosed and much more can be learned about them. Sedimentary and volcanic rocks in southeast Alaska span a considerable age range, from 200 million to perhaps 1 billion years old, and locally host large mineral deposits. In the North Coast, the metamorphosed sedimentary and volcanic rocks are preserved as narrow, but remarkably persistent northwest trending belts. There are two main belts, separated by granite. The eastern, or Ecstall belt, is 10-20 km wide and extends southeast from Prince Rupert through the Ecstall River drainage to Hawkesbury Island and beyond. The western belt, herein named the Dundas-Porcher belt, includes parts of Stephens and Dunira islands, and extends southeast as a narrow band, as little as a few hundred metres wide, on the eastern side of Pitt Island.

The Coast Range is characterized by many long, northwest topographic features. Some are faults, zones where rocks have moved in different directions over several to hundreds of kilometers. Other topographic features appear to be deep fractures in the Earth's crust. Their geologic significance is uncertain and they are simply called "lineaments". Examples are the Work Channel Lineament (which can be traced hundreds of kilometres), Grenville Channel and the Principe-Laredo Faults. These faults and lineaments probably formed during the latter stages of granite formation and metamorphism, and possibly during subsequent uplift (i.e. 50 to 70 million years ago). Another prominent feature is the Terrace Graben. It is a 100 kilometre-long valley that extends from Kalum Lake to Kitimat and cuts obliquely across the eastern boundary of the Coast geologic belt. It appears to be a younger feature than the Coast Range lineaments, perhaps 40-50 million years old.

Surficial (Quaternary) geology

The Prince Rupert area is devoid of sand and gravel resources because, prior to glaciation, the Skeena River drained south through the Kitimat Valley. Gravel and sand are deposited by fast-flowing streams. A reduction in the stream gradient reduces the ability of the stream to transport coarse material and thick aggregate deposits will form. Historically in the Skeena River drainage, this occurred where the river entered Douglas Channel, at a point between Terrace and Kitimat as the river delta built up. Prior the glaciation, the present-day lower Skeena valley, west of Terrace, was an arm of the sea, a fiord. Thick deposits of glacial till left behind by waning glaciers diverted post-glacial Skeena River away from its historic path to this new outlet to the ocean. However, because this was a fiord, the stream gradient is essentially flat. No coarse material is carried beyond the junction of the Gitnadoix River, 40 kilometres downstream from Terrace. Only silt is deposited further downstream to the present delta. In contrast, the Kitimat Valley is rich in sand and gravel deposits, large alluvial fans north and south of Lakelse Lake that were deposited on the edge of a large glacial lake.

In addition to changes in drainage pattern that happened as a result of glaciation, it is important to understand that sea-level, relative to the elevation of land, changed dramatically during and after the Ice Age as a result of two processes. Sea level was much lower because a large amount of the Earth's water was incorporated in large sheets of ice that covered all the northern latitudes. This was partially offset by a second phenomenon. The great weight of continental ice sheets depressed the land. (Because the interior of the Earth is molten, and not solid rock, its shape can be deformed.) Rebound is a gradual process; although the ice melted 20,000 years ago, the land is still rising to return to its natural elevation. For this reason, beach deposits can be found up to 200 metres above present-day sea level.

Glaciation denuded most of the North Coast of pre-existing gravel, sand and soil and deposited them in areas that are now under water offshore. Only a few pockets of glacial moraine, or drift, remain in the Prince Rupert area. Most of the area is bare bedrock, or a thin veneer of organic material, peat and fine black muck. Over-steepened slopes are common. They were carved by deep valley glaciers and side glaciers in hanging valleys. With the disappearance of the ice, these slopes become unstable, resulting in rock avalanche and landslide deposits. Landslides and snow-rock avalanches continue to be a significant geologic hazard in the North Coast.

APPENDIX 3: PROTECTED AREAS STRATEGY GAP ANALYSIS

Campania Island Area of Interest / Official Study Area

The Campania Island Official Study Area (OSA) is found within the Hecate Lowlands Ecosection (HEL) in the North Coast Forest District. The Regional Protected Areas Team (RPAT) has classed this ecosection as a Class II ecosection, on a scale of I to IV (highest to lowest priority). This ranking is based on the current gaps in representation and the extent of existing and anticipated disturbance. The OSA consists of approximately 17,000 hectares of land and a marine component of 10,000 hectares.

Gap analysis identified the following gaps in representation in the HEL:

- complete, intact island ecosystem
- wetland complex: bogs and fens (muskeg)
- estuaries, fjord inlets and lakes
- offshore islets / seabird nesting colonies
- marine feeding areas
- marine passages with strong tidal currents
- internationally significant range of coastal marine settings - greater representation required to accommodate high levels of use
- protected anchorages

Terrestrial Ecosystem Representation

Ecosystem	Area in HEL		Area in Campania	
	hectares	Protected %	hectares	%
Alpine Tundra - AT	4,200	0	0	0
Coastal Western Hemlock very wet hypermaritime subzone - CWHvh	1,398,200	4.2	16,400	1.2
Coastal Western Hemlock very wet maritime - CWHvm	10,500	0	0	0
Mountain Hemlock wet hypermaritime subzone - MHwh	112,100	1.2	600	0.5
Total	1,525,000	4.0	17,000	1.1

Values and Attributes of the Campania Island OSA

- Ratings: Conservation - high; Recreation - high
- Special Features: Weinberg Inlet; McMicking Inlet (Goal 2 areas)
- intact island ecosystem
- lowland coastal muskeg (fens and bogs) with several rare/unusual plants
- long, narrow inlets linked to freshwater lakes
- marine habitats, including small estuaries and extensive kelp beds off west coast
- presence of rare benthic marine algae (*Codium ritteri*) off north coast of island
- recreational opportunities: protected anchorages, remote white sand beaches, good hiking opportunities, easy overland travel through muskeg, warm upland lakes

Dundas Island Area of Interest / Official Study Area

The Dundas Island Official Study Area (OSA) is in the northern portion of the Hecate Lowlands Ecosection (HEL), in the North Coast Forest District. The Regional Protected Areas Team (RPAT) has classed this ecosection as a Class II ecosection, on a scale of I to IV (highest to lowest priority). This ranking is based on the current gaps in representation and the extent of existing and anticipated disturbance. The OSA consists of approximately 22,000 terrestrial hectares, with a marine component of 36,000 hectares.

Gap analysis identified the following gaps in representation in the HEL:

- ☐ complete, intact island ecosystem
- ☐ wetland complex: bog and fens (muskeg)
- ☐ fjord inlets, estuaries and lakes
- ☐ offshore islets / seabird nesting colonies
- ☐ marine feeding areas
- ☐ marine passages with strong tidal currents
- ☐ internationally significant range of coastal marine recreation settings - greater representation required to accommodate high levels of use
- ☐ protected anchorages

Terrestrial Ecosystem Representation

Ecosystem	Area in HEL		Area in OSA	
	hectares	Protected %	hectares	%
Alpine Tundra - AT	4,200	0	0	0
Coastal Western Hemlock very wet hypermaritime subzone - CWHvh	1,398,200	4.2	22,300	1.6
Coastal Western Hemlock very wet maritime - CWHvm	10,500	0	0	0
Mountain Hemlock wet hypermaritime subzone - MHwh	112,100	1.2	0	0
Total	1,525,000	4.0	22,300	1.5

Values and Attributes of the Dundas Island OSA

- ☐ Ratings: Conservation - very high; Recreation - high to very high
- ☐ cluster of intact island ecosystems along outer coast
- ☐ marine feeding habitats - shallow reefs and bays, mudflats
- ☐ coastal muskeg and scrubby forest
- ☐ rocky islets - seabird colonies including pigeon, guillemot, black oystercatcher, glaucous-winged gull and the red-listed pelagic cormorant
- ☐ extensive kelp beds

- passages with strong tidal currents which ensure a good exchange of water and nutrients
- recreation opportunities and settings including fishing, sea kayaking, rock / sand beaches, coastal marine channels / inlets

Pearse Island Area of Interest / Official Study Area

The Pearse Island Official Study Area (OSA) is entirely within the Alaska Panhandle Mountains (APM) ecosection. This ecosection has been ranked by the Regional Protected Areas Team as a Class II ecosection, on a scale of I to IV (highest to lowest priority). This classification is based on the current gaps in representation and the extent of existing and anticipated disturbance in this ecosection. The OSA, which encompasses an intact watershed between the Pearse Canal and the Portland Inlet, is 11,000 hectares.

Gap analysis identified the following gaps in representation in the APM:

- low elevation productive forest - Coastal Western Hemlock
- estuaries and riparian habitats
- maritime elements
- mountain hemlock - amabilis fir - yellow-cedar forest (montane/subalpine)
- fjord, river/floodplain/delta, estuarine and forested slope to alpine backcountry recreational settings
- boating, sport fishing and wildlife viewing opportunities
- marine park candidates for representation of fjords and estuaries

Terrestrial Ecosystem Representation

Ecosystem	Area in APM		Area in OAS	
	hectares	**Protected %**	**hectares**	**%**
Coastal Western Hemlock very wet hypermaritime subzone- CWHvh	192,100	0.4	10,300	5.4
Coastal Western Hemlock - CWH (all other subzones)	152,400	0.5	0	0
Mountain Hemlock, moist maritime subzone - MHmm	168,200	0.4	0	0
Mountain Hemlock - wet hypermaritime, windward variant - MHwh1	5,100	0	1,000	19.6
Alpine Tundra - AT	106,300	0.4	0	0
Total	471,500	0.4	11,300	2.4

Values and Attributes of the Pearse Island OSA

- ☐ Ratings: Conservation - very high; Recreation - medium
- ☐ intact watershed
- ☐ coastal temperate rainforest ecosystems - Coastal Western Hemlock very wet hypermaritime subzone (CWHvh)
- ☐ riparian habitat
- ☐ recreational boating and ocean fishing
- ☐ maritime elements
- ☐ alpine backcountry recreation setting/opportunity

Stephens / Porcher Islands Area of Interest / Official Study Area

The Stephens / Porcher Islands Official Study Area (OSA) is found within the Hecate Lowlands (HEL) ecosection, in the North Coast Forest District. The Regional Protected Areas Team (RPAT) has classed this ecosection as a Class II ecosection, on a scale of I to IV (highest to lowest priority). This ranking is based on the current gaps in representation and the extent of existing and anticipated disturbance. The OSA consists of approximately 16,000 hectares of land, with a marine component of 40,000 hectares.

Gap analysis identified the following gaps in representation in the HEL:

- ☐ complete, intact island ecosystem
- ☐ wetland complex: bogs and fens (muskeg)
- ☐ fjord inlets, estuaries and lakes
- ☐ offshore islets / seabird nesting colonies
- ☐ marine feeding areas
- ☐ marine passages with strong tidal currents
- ☐ internationally significant range of coastal marine recreation settings - greater representation required to accommodate high levels of use
- ☐ protected anchorages

Terrestrial Ecosystem Representation

Ecosystem	Area in APM		Area in OAS	
	hectares	Protected %	hectares	%
Alpine Tundra - AT	4,200	0	0	0
Coastal Western Hemlock very wet hypermaritime subzone - CWHvh	1,398,200	4.2	16,300	1.2
Coastal Western Hemlock very wet maritime - CWHvm	10,500	0	0	0
Mountain Hemlock wet hypermaritime subzone - MHwh	112,100	1.2	0	0
Total	1,525,000	4.0	16,300	1.1

Values and Attributes of the Stephens / Porcher OSA

- Ratings: Conservation - very high; Recreation - high
- Special Features: Oval Bay/Welcome Harbour; Stephens Passage; and Kitkatla Inlet (Goal 2 areas)
- large protected marine inlets - Kitkatla, Porcher, Billy Bay
- coastal muskeg and scrubby forest
- very important wetlands, tidal flats and marine shallows for waterfowl
- red and blue-listed species - trumpeter swan, brant, oldsquaw, western grebe, pacific loon and great blue heron
- large herring spawn
- Oval Bay - long sandy / pebble beach with excellent beachcombing opportunities
- protected anchorages, including Welcome Harbour
- existing BC Forest Service Recreation Site at Welcome Harbour